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ZAUMEYER (W. J.). **A streak disease of Peas and its relation to several strains of Alfalfa mosaic virus.**—*J. agric. Res.*, lvi, 10, pp. 747–772, 5 pl., 1938.

An account is given of the author's comparative studies of a new virus disease of peas, of the streak type, attributed to pea streak virus 1 [*R.A.M.*, xvii, p. 220] with three strains of lucerne mosaic virus, designated virus 1, 1A, and 1B [ibid., xv, p. 274]. The origin of the pea streak disease is not definitely known, but it was first observed in the greenhouse at the Arlington Experimental Farm, Virginia, in 1934, and may have originated on mosaic-infected lucerne plants. The results showed that these viruses differed in the symptoms produced on numerous hosts, in their virulence to varieties of peas and beans [*Phaseolus vulgaris*], in their host range, and in their properties *in vitro*. On peas the pea streak virus 1 caused a streaking of the stems, petioles, and main veins of the leaves, but no leaf-mottling, while all the lucerne mosaic viruses produced leaf-mottling and strain 1B also caused a leaf spot and a slight streaking of the stems. The pea streak virus did not infect any host species outside the family Leguminosae; it was not infectious to bean, but all the 17 varieties of peas tested were susceptible to it. The lucerne mosaic viruses, on the other hand, besides being infective to many legumes, also infected tobacco, *Petunia hybrida*, *Datura stramonium*, cucumbers, and *Zinnia elegans*; they produced local necrotic lesions on beans, and of the pea varieties tested Horal alone was immune from all of them.

Special tests showed that the pea streak virus was inactivated between 62° and 65° C., lost its infectivity *in vitro* after two days, and tolerated dilution of about 1 in 5,000. Lucerne mosaic viruses 1 and 1A were inactivated between 65° and 70° in ten minutes, and lucerne mosaic virus 1B between 70° and 75°; all lost their infectivity *in vitro* after four to five days' ageing, and lucerne mosaic virus 1 lost its activity at a dilution of about 1 in 2,000 and the other two strains at about 1 in 3,000. The pea streak virus can be separated from a mixture with the lucerne mosaic viruses by inoculating the Horal pea, which is susceptible to pea streak. The lucerne mosaic viruses can be separated from a mixture with pea streak virus by inoculating beans, soy-bean, cowpea, *Lupinus albus*, and other hosts susceptible to all three of the former but resistant to the latter. Lucerne mosaic viruses 1A and 1B can be separated from a mixture with lucerne mosaic virus 1 by inoculating zinnia or cucumber which are resistant to the last-named, or by

diluting a virus mixture 1 in 3,000, at which dilution lucerne mosaic virus 1 is inactivated but not the other two. Lucerne mosaic virus 1A can be separated by inoculating Pink Cockade sweet pea, which is resistant to the other two strains, and lucerne mosaic virus 1B can be separated by diluting a virus mixture 1 in 1,000 and inoculating the Capucijner pea variety, on which the virus produces a necrotic spotting of the leaves above the point of inoculation; reinoculation of the same variety with the expressed juices of the necrotic tissues and repetition of this process yields lucerne mosaic virus 1B free from the other two strains. So far no method has been found of obtaining the lucerne mosaic virus 1 free from the strains 1A and 1B.

NELSON (R.) & LEWIS (R. W.). **Comparisons of fungicides for control of Celery leaf blights.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xx, 4, pp. 210–221, 1 fig., 1938.

In a further comparative dusting test on two farms in Michigan the best control of early and late blight of celery (*Cercospora apii* and *Septoria apii* and its var. *graveolentis*, respectively) [*R.A.M.*, xvii, p. 498] was given by copper sulphate-lime (standard 20–80), followed by cuprocide (red copper oxide+filler), and then by basicop [ibid., xvii, p. 694], mike sulphur [ibid., xvi, p. 542] giving poor control, but comparatively high yields, presumably because by increasing soil acidity it favoured plant growth. Thirteen applications of the copper dusts were made on one farm, and 16 on the other, each at the rate of 35 to 40 lb. per acre.

In spraying trials on Golden Self Blanching celery an outbreak of bacterial blight (*Bacterium apii*) [ibid., xii, p. 495] occurred, the best control of which was given by Bordeaux mixture (8–12–100), basicop (4–0–100) and cupro-K (copper oxychloride: 8–0–100) giving good commercial control and proving superior to cuprocide-54 (incorporating a sticker). The early and late blights were best controlled by Bordeaux mixture, while basicop and cuprocide-54 gave satisfactory commercial control, and cupro-K was less effective, the yields of the treated plants being increased over those of the unsprayed controls by 25, 22, 23, and 20 per cent., respectively. Twelve applications were made of each spray, at the rate of 100 gals. per acre on each occasion.

In a further test, 11 applications of Bordeaux mixture (8–12–100), basicop, mike sulphur, and copper oxychloride A (4·5–0–100) and B (3·5–0–100) gave, respectively, 23, 32, 115, 70, and 23 infections of leaf blights per leaflet (average), as against 50 in the unsprayed controls. In the authors' experiments the better fungicidal qualities of Bordeaux mixture, as compared with the other materials tested, appeared to be due to its greater adhesiveness during rain. Local growers are advised to depend on Bordeaux mixture (8–12–100) and copper sulphate-lime dust (20–80) for the control of celery leaf blights.

ARK (P. A.) & TOMPKINS (C. M.). **A soft-rot bacteriosis of Pumpkin fruits.**—*Phytopathology*, xxviii, 5, pp. 350–355, 4 figs., 1938.

The bacterium isolated from pumpkin fruits affected by the soft rot already reported from California [*R.A.M.*, xvi, p. 15] has now been

identified as *Erwinia aroideae*. Besides the varieties previously mentioned field observations and greenhouse tests established the susceptibility of 12 varieties of squashes (*Cucurbita maxima*), 7 of cushaws (*C. moschata*), 16 of vegetable marrows (*C. pepo* var. *condensa*), the Lithuanian gourd (*C. pepo ovifera*) vars. *maliformis, pyriformis verrucosa*, and *striata elongata*, and the white-flowered gourd (*Lagenaria leucantha*). The only resistant plants were found in an unknown Indian variety of *C. moschata* and in two Lithuanian gourds (vars. *pyriformis striata* and *maliformis lutea*).

The following varieties of celery (a natural host of the pathogen) proved susceptible in inoculation tests: Florida Golden, French Long Top, Golden Phenomenal, Golden Plume and its hybrid, Lagomarsino Special, Long Standing Golden Plume, Tall Paris Golden Yellow, Tethers Special French Tall Strain, and Yellow Hybrid, while Golden Detroit, Utah or Golden Crisp, and Wild Type No. 2 were resistant. The pumpkin strain of *E. aroideae* further disintegrated the fleshy parts of certain *Opuntia* spp., which are ordinarily resistant to the organism.

WIANT (J. S.). **Market-storage studies of Honey Dew Melons and Cantaloups.**—*Tech. Bull. U.S. Dep. Agric.* 613, 19 pp., 5 pl., 1938.

In the course of investigations conducted from 1931 to 1936 Honey Dew melons and cantaloupes were placed in cold storage after their arrival on the New York market from the western States by refrigerator cars and kept at three different ranges of temperature, viz., 32° to 34°, 36° to 38°, and 40° to 42° F., at a relative air humidity varying between 75 and 85 per cent. Careful examination after varying storage periods revealed that Honey Dew melons were subject to a low temperature breakdown after a fortnight's storage at 32° to 34° and to a smaller extent at 36° to 38°, but that the injury did not occur at higher temperatures. Cantaloupes were not affected. The injury is described as a breaking down of the epidermis and rind of the melon, first becoming apparent as a faint water-soaking of the rind accompanied by the oozing-out of juice, but later developing a wide range of symptoms resembling those of spotting, watery breakdown, or scald, with the formation of either small or extensive drab-coloured lesions, which become darker with age. The diseased melons show no internal symptoms, the flesh and the flavour remaining normal except in very severe cases. The most common decay developing on stored melons and cantaloupes at the time of their removal from cold storage or soon after, was caused by *Cladosporium cucumerinum*, which occurred at 40° to 42° after one week of storage and even at 32° to 34° after a fortnight [*R.A.M.*, xvii, p. 155]. The results of the tests suggest that cantaloupes removed from the refrigerator cars can be held in cold storage for one week or slightly longer at 32° to 34° F., while Honey Dew melons can be stored for a fortnight at either 32° to 34° or 36° to 38°, and certain lots for even longer. The riper the melons, the shorter should be the storage period. Frequent inspections of the stored melons are also advised.

Zycha (H.). **Ergebnisse und Probleme der Champignonkultur.** [Results and problems of Mushroom culture.]—*Hedwigia*, lxxvii, 5–6, pp. 294-316, 2 graphs, 1938.

This is a critical discussion of the literature (mostly recent) dealing with various aspects of mushroom [*Psalliota* spp.] culture, including methods of cultivation, the nutritional requirements of the crop (with special reference to the problem of a synthetic fertilizer as a substitute for horse manure [*R.A.M.*, xvii, p. 648]), environmental conditions in relation to growth, average yields, fungal diseases [ibid., xvii, p. 430 *et passim*], and the possibility of introducing or extending the production of other edible fungi [ibid., xvii, p. 649] under German conditions.

Barducci (T. B.). **La selección como medio de lucha contra la marchitez del Ajé.** [Selection as a means of combating Chilli wilt.]—*Inf. Estac. agric., Lima*, 43, 7 pp., 1 fig., 1938.

Full directions are given for the application of the process of selection to the control of wilt (*Fusarium annuum*) in chillies [*R.A.M.*, xvii, p. 371], of which the species most commonly cultivated in Peru (where the disease was first detected in 1935) are stated to be *Capsicum frutescens*, *C. pubescens*, *C. conicum*, and *C. longum*.

Szirmai (J.). **Die 'Dörrfleckenkrankheit' (Hitzeschaden) des Paprikas.** [The 'dry spot disease' (heat injury) of Chilli.]—*Phytopath. Z.*, xi, 1, pp. 1–13, 7 figs., 1938.

The Hungarian chilli crop is stated to be subject to yield reductions of up to 12 per cent. from the 'dry spot disease', characterized by the presence on the apical portion of the fruits of unilateral, oval, yellow lesions, gradually expanding, turning leaden-grey, and rotting in wet weather, while under dry conditions a greyish-blue tinge develops, followed by desiccation. *Alternaria tenuis* occurred in profusion on the necrotic areas, but inoculation experiments with conidial suspensions of the fungus on seeds, seedlings, flowers, and fruits of the Szegedin, Kalinko, and Király varieties gave uniformly negative results. Infection was eventually secured by the introduction of the fungus into the interior of the fruits and leaving the plants without water for a week or placing them in the incubator at a temperature of 25° to 27° C. At the most, therefore, *A. tenuis* is a facultative parasite of chilli plants enfeebled by drought or heat. The symptoms of 'dry spot' were induced in the laboratory on previously moistened areas of the fruits by exposure to hot air at 50° to 52°, but for dry material a minimum of 55° was necessary to secure comparable results. In the greenhouse the dry lesions developed on moistened fruits under exposure to the sun's rays at a minimum temperature of 49°.

Silberschmidt (K.). **O mosaico da Mandioca.** [Cassava mosaic.]—*Biologico*, iv, 6, pp. 177–181, 1 pl., 1 fig., 1938.

The 'Vassourinha' variety of cassava in the State of São Paulo, Brazil, is stated to be relatively frequently affected by a condition, the main symptom of which is the presence on the upper surface of the leaves of yellowish-white spots and streaks, 2 to 3 mm. broad, and on

the under surface of localized, depressed necroses immediately beneath the spots and streaks. These markings stand out particularly clearly on the younger, developing leaves, which are generally deformed, and have irregularly curved veins and crenated margins. As a rule, the spots and streaks are irregularly dispersed over the leaf surface, but not infrequently they occur in the angle between the main and the secondary veins or may develop along the main veins. Similar spots and streaks, but almost exclusively associated with the main veins, were also observed in an undetermined cassava variety in one locality. In the 'Brava preta de Suruhy' variety the condition may appear either as large, coherent yellowish-white spots and streaks enclosing the secondary veins, or as a light green mosaic pattern involving most of the leaf surface, without the development of the yellowish-white markings. The nature of the symptoms, together with the fact that the condition was reported by Alvaro Costa to be transmissible by grafting and by Aleurodid insects, leads the author to believe that one or more viruses may be implicated. So far no harmful effect on the yield of affected cassava plants has been noted in São Paulo, but in view of the economic importance of cassava mosaic [*R.A.M.*, xvii, p. 649] it is recommended that planting material should only be taken from plants free from any suspicious symptom. Preliminary observations indicate that narrow-leaved varieties (e.g., Vassourinha) are less severely attacked than broad-leaved (e.g., Palma).

Bigi (F.) & Ciferri (R.). **Segnalazione della 'Rosetta' dell' Arachide nella Somalia Italiana.** [Groundnut rosette reported from Italian Somaliland.]—*Agricoltura colon.*, xxxii, 3, pp. 105–113, 2 figs., 1938.

Groundnut rosette [*R.A.M.*, xvii, p. 582] has been observed by the two authors independently in the Ginha and Genale areas of Italian Somaliland since 1935. The disease is not at all widespread, but affected plants occur in scattered clumps. Plants that show only rosette symptoms as distinct from leaf mottle appear to be attacked while in an early stage of growth; the leaves are dwarfed, clustered together in rosettes, and, at first, strikingly chlorotic. A description is given of the gradual development of the symptoms of the disease on the Spagnola, Africana, and Khandeish varieties growing under comparable conditions. The symptoms differed very slightly on the three varieties and were also affected by the environmental conditions; on Khandeish (erect habit) chlorosis was more prevalent and more conspicuous than leaf curl, whereas on Africana the reverse obtained. Khandeish was the most susceptible, Spagnola less so, and Africana the most resistant.

The economic importance of the disease is at present almost negligible. Most of the attacks occur as leaf mosaic only, late in the season, *Aphis laburni* is relatively scarce, and the crop is grown close together during two periods separated by a dry season unfavourable to the insect.

In a footnote the authors state that in the south of the country groundnuts are attacked late in the season by leaf spot (*Cercospora personata*) [ibid., xvii, p. 651], while the most prevalent disease in this area is chlorosis due to unfavourable soil and weather conditions.

MARTINOFF (S. I.). Сравнителенъ опитъ съ нѣколко срѣдства за борба съ пепелницата, **Uncinula necator (Schw.) Burr. (Oidium tuckeri Berk.)** по Лозата. [Comparative tests of some preparations for the control of powdery mildew, *Uncinula necator* (Schw.) Burr. (*Oidium tuckeri* Berk.) of the Vine.]—Pamphlet issued by the Plant Protection Institute, Sofia, 19 pp., 1938. [English summary.]

Some details are given of experiments in 1937 at Varna, Bulgaria, the results of which showed that two treatments (on 24th June and 16th July) with a sulphur-containing spray, following three dustings with sulphur, gave better protection to vines against powdery mildew (*Uncinula necator*) [*R.A.M.*, xvii, pp. 194, 652] than six sulphur dustings during the season. Of the sprays tested the best control was obtained with 1 in 80 lime-sulphur, which caused, however, slight scorching, especially when resin soap was added to it. 'Plodorod', a proprietary wettable sulphur, controlled the disease almost as well (especially with the addition of resin soap) as lime-sulphur and did not cause any scorching. Another preparation, 'Baria' (barium polysulphide), also gave satisfactory results without scorching. A mixture of lime-sulphur with 1 per cent. Bordeaux mixture and resin soap, while effective against *U. necator*, produced severe scorching and was not so good as Bordeaux mixture alone against downy mildew (*Plasmopara viticola*).

BOSC (M.). **Résultats d'essais de bouillies cupriques au sulfate d'ammoniaque.** [The results of tests with cupric mixtures containing ammonium sulphate.]—*Progr. agric. vitic.*, cix, 20, pp. 458–461, 1938.

In this paper the author adduces further evidence obtained as a result of inquiries sent out to numerous growers and research workers in France, on the effectiveness of using ammonium sulphate with cupric sprays against vine mildew [*Plasmopara viticola*: *R.A.M.*, xv, p. 628]. The mixture is stated to be more strongly adhesive than Bordeaux mixture. Five years' controlled tests have demonstrated that the new mixture reduces the amount of copper sulphate required, improves the condition of the foliage, and both diminishes the number of lesions that develop and causes them to dry up.

GONÇALVES (R. D.). **Principaes doenças da Videira em São Paulo.** [Chief diseases of the Vine in São Paulo.]—*Biologico*, iv, 1, pp. 8–10; 2, pp. 25–29; 3, pp. 76–82; 4, pp. 115–121; 5, pp. 145–152; 6, pp. 196–200, 10 figs., 1938.

In this series of papers the author gives an account of the major diseases of the vine occurring in the State of São Paulo, Brazil, among which anthracnose (*Sphaceloma ampelinum*) [*Elsinoe ampelina*: *R.A.M.*, xvii, p. 221] is stated to be economically the most important. The other diseases considered include downy mildew (*Plasmopara viticola*); powdery mildew (*Uncinula necator*); leaf blight (*Cercospora viticola*) [*C. vitis*: ibid., xvii, p. 95]; bitter rot (*Melanconium fuligineum*) [ibid., xvi, p. 17]; ripe rot of the grapes (*Glomerella cingulata*) [loc. cit.]; and root rot (*Rosellinia necatrix*) [ibid., xvii, pp. 95, 653]. Control measures are indicated in each case. [This paper, with 12 additional figures, has been issued by the Ministry for Agriculture, Industry, and Commerce of São Paulo, in the form of a pamphlet.]

DEMAREE (J. B.), DIX (I. W.), & MAGOON (C. A.). **Observations on the resistance of Grape varieties to black rot and downy mildew.**—*Proc. Amer. Soc. hort. Sci.*, xxxv, pp. 451–460, 1938.

Observations [which are tabulated] made during 1937 at the Arlington Experiment Farm, Virginia, on the relative resistance of 270 American Euvitis and European Vinifera vines to black rot (*Guignardia bidwellii*) [*R.A.M.*, xvi, p. 17; xvii, p. 95] and downy mildew (*Plasmopara viticola*) [ibid., xvi, p. 627; xvii, p. 652] showed that 27 varieties were conspicuously resistant to both diseases, 17 notably resistant to *P. viticola* but highly susceptible to *G. bidwellii*, 63 highly resistant to *G. bidwellii* but very susceptible to *P. viticola*, 127 moderately to slightly resistant to both, and 36 (of the Vinifera type) highly susceptible to both. Of the varieties very resistant to both diseases, Franklin was unaffected by either, while America, Dakota, Neosho, and Suelter showed only a trace of each. It is concluded that *Vitis riparia*, *V. aestivalis*, *V. lincecomii*, and *V. labrusca* are the most promising sources of desirable material for the development of vines resistant to these diseases.

PETRI (L.). **Rassegna dei casi fitopatologici osservati nel 1937.** [Review of phytopathological records noted in 1937.]—*Boll. Staz. Pat. veg. Roma*, N.S., xviii, 1, pp. 1–66, 9 figs., 1938.

This report [cf. *R.A.M.*, xvi, p. 587] contains numerous items of phytopathological interest, of which the following may be mentioned. In January, 1937, vines in the vicinity of Modena were severely affected by 'rogna' (*Bacterium tumefaciens*) [ibid., vi, p. 526; xiv, pp. 676, 740], the white varieties, especially Lugliatica, suffering most; the Lambrusco variety was not attacked.

When vine branches affected with rachitism [ibid., xvii, p. 221] were grafted on to healthy vines and healthy branches on to affected vines the resultant growth was in every case normal. The fruit on the vines affected in 1936 developed and matured in a normal manner, though a few very severely affected vines died. It is concluded that in most cases this form of rachitism is not a progressive, but a curable disease, and is not transmissible by grafting. The cause of the condition is at present unknown.

Vines affected with 'arriciamento' [leaf roll: ibid., xvii, p. 95] showed no improvement following an application of 300 gm. of zinc sulphate, but when an equal quantity of potassium sulphate was added to the application markedly beneficial results were obtained, which persisted into the second year, without any further application, though in the third year the vines relapsed into their original condition.

Peaches in the province of Forli were widely affected by parasitic silver-leaf disease [*Stereum purpureum*: ibid., xiii, p. 385], but the physiological form of the condition [loc. cit.] was uncommon.

Oranges from two localities were attacked by root rot due to *Phytophthora citrophthora*. The Jora Tenga lemon variety, brought from India, was susceptible to mal secco [*Deuterophoma tracheiphila*: ibid., xvii, p. 521], to which the Sinatra and Quattrochi varieties showed marked resistance. The disease was also found in Calabria, where inquiries

indicated that it has been present for about seven years. Mandarin oranges (*Citrus* [*nobilis* var.] *deliciosa*) were attacked by *P. citrophthora* in association with secondary infection by *Botrytis* sp. and *Penicillium* sp.

Siberian elms in the commune of Novellara were attacked by root rot attributed to a species of *Phytophthora*. Canadian poplars (*Populus canadensis*), planted out in 1936, were killed off in May, 1937 to the extent of 90 per cent. as a result of infection by *Dothichiza populea* [ibid., xvii, p. 569]. Canadian poplars and poplars of the Italian variety A.M. bore dry, more or less rounded spots surrounded by a reddish margin in the centre of the leaves due to *Phyllosticta populina* [ibid., xiv, p. 478].

The leaves of *Dianthus caryophyllus* plants from Terracina showed circular, violaceous-red spots with a dry centre revealing the presence of *Phytomonas* [*Bacterium*] *woodsii* [ibid., xiv, p. 365]. *Hydrangea hortensia* leaves showed brown, confluent areas due to *Phyllosticta hydrangeae* [ibid., vi, p. 421].

Lucerne plants from Tripoli showed the presence of *Fusarium oxysporum* var. *medicaginis* [ibid., ix, p. 531], apparently the first record of this fungus from Africa.

Edwards (W. H.). **Report on an agricultural survey in the Cayman Islands. With notes on the more important pests and diseases which were found attacking economic plants in that Dependency of Jamaica.**—*Bull. Dep. Sci. Agric. Jamaica*, N.S., 13, 40 pp., 10 figs., 1938.

In the section of this report dealing with plant diseases (pp. 20–27), it is stated that coco-nut bud rot [? *Phytophthora palmivora*: *R.A.M.*, xvii, p. 299] had been primarily responsible for the destruction of groves that once existed in the Cayman Islands. Many cases were noted, but the disease does not at present assume epidemic proportions because the trees are now widely scattered. The disastrous nature of the outbreaks locally has been due to complete neglect of all precautions to prevent spread, though outbreaks can be checked by the immediate destruction of infected palms. The only disease affecting bananas was Panama disease [*Fusarium oxysporum cubense*], which has appeared near George Town in Grand Cayman, and is a very serious menace. Citrus gummosis [? mainly due to *P. parasitica*: ibid., xvi, p. 312] was rampant everywhere.

Stell (F.). **Report of Plant Pathologist, 1937.**—*Rep. Dep. Agric. Trin. Tob. 1937*, pp. 65–70, 1938.

In 1936–7 the average loss of mature cacao pods from witches' broom (*Marasmius perniciosus*) [*R.A.M.*, xvi, p. 728] on 11 plantations in infected areas in Trinidad amounted to 37·5 per cent., though the corresponding loss during the same period at the Government estate at Marper (also situated in a heavily diseased locality, but where all diseased pods and brooms are destroyed four times a year) was only 7·5 per cent. Counts on 100 trees in a heavily infected area in Manzanilla showed that in one complete year 55,471 sporophores were produced, a figure equivalent to 150,000 sporophores per acre of cacao, or 500 sporophores per tree per year.

In 1934 some 150,000 trees were examined to discover resistant types; the work has been continued, and after a process of elimination 12 trees remain which show resistance. A further 60,000 trees were examined in 1936, and all trees with five or more affected tissues were eliminated. As a result, 17 trees out of this lot appear to be highly resistant, but inspection and checking are to be continued before propagation work is undertaken. Seven trees appear to be resistant at Marper.

The Marper estate, comprising 92 acres of cacao, has maintained an average yield of 2½ bags [412 lb.] per acre since its purchase in 1929, as against an estimated yield in the whole district of about 2 bags per acre before 1928, when the disease first appeared. In spite of systematic control, witches' broom is increasing at Marper, pod loss having risen from 2 to 7·5 per cent., with a prospect of a further rise next season. Control costs about $4 per acre per year, and on a commercial plantation this figure would probably be $3 to 3·5. Success, therefore, requires good crops and good prices; the former are largely lacking in many districts, and the latter were unobtainable in January, 1938.

The disease of immortelle trees [*Erythrina velutina* and *E. umbrosa*] previously reported as due to a species of *Sphaerostilbe* [ibid., xv, p. 76] and now stated to be caused by *Calostilbe striispora* (Sacc.) Seaver (syn. *S. musarum* Ashby), has since been found in many different parts of Trinidad, especially where floods are a periodic occurrence.

Since 1936, 248 sour orange trees [*Citrus aurantium*] and 1,740 sour orange seedlings in nurseries have been destroyed, and 150 rough lemon trees [*C. limonia*] and 25 rough lemon seedlings cut out and burnt in an attempt to control scab (*Sphaceloma fawcettii*) [*Elsinoe fawcetti*: ibid., xvii, p. 595] on grapefruit in the Santa Cruz valley in the Northern Range. A survey of the district showed 2,964 grapefruit trees to be mildly affected; the diseased twigs, leaves, and fruits were cut out and burnt. In a small scale experiment, two applications of Burgundy mixture (4–5–50) with milk gave an average of only one scabbed fruit per tree, as compared with an average of 48 scabbed fruits on the unsprayed control trees.

Sporadic cases of mild mottle leaf of citrus occur, and greasy spot [cf. ibid., xv, p. 2] is very common.

Bananas in poor soil and in situations exposed to the wind were particularly susceptible to infection by *Cercospora musae* [ibid., xvii, p. 610]; great care is clearly necessary in the proper selection of sites for banana growing. In Grenada the disease is mild and sporadic, only a very few of the plantings being as yet affected. Almost always, the middle and upper leaves are free from the trouble, which is mostly confined to the lower leaves. Under Grenada conditions, the control measures recommended consist in destroying all the aerial parts of badly affected plants, stripping off and burning or burying infected foliage where infections are mild and scattered, and pruning surplus suckers. Stripping and destroying the affected leaves has given promise of appreciable control.

Report of the Agricultural Department, Dominica, 1937.—Trinidad, Imper. Coll. Trop. Agric., 33 pp., 1938.

The following items of phytopathological interest occur on pp. 14–15

of this report. In 1937 the estimated average monthly incidence of Panama disease (*Fusarium* [*oxysporum*] *cubense*) [*R.A.M.*, xvi, p. 656; xvii, pp. 375, 611] of bananas in the areas inspected amounted to 22 per cent. infected plots and 1·16 per cent. infected stools, as against 29 and 1·58 per cent., respectively, for 1936. These figures do not include abandoned plots or those where the disease is beyond control. Occupiers of plots containing 10 per cent. or more affected stools are forbidden to remove planting material from affected areas. In February, 1938, *Cercospora musae* appeared in one plantation.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, xlix, 6, pp. 320–324, 4 figs., 7, pp. 386–390, 5 figs., 1938.

By a modification made in March, 1937, in the Plant Diseases Act of New South Wales (1924) every owner and occupier of land on which any tobacco plants have been planted after 30th June in any year must uproot and destroy by burning every such plant by the 30th June of the following year. By this means it is hoped materially to reduce the incidence of blue mould [*Peronospora tabacina*: *R.A.M.*, xvii, p. 565].

The safest method of preventing virus-caused woodiness of passion fruit [*Passiflora edulis*: ibid., xv, p. 593] is for growers to raise their own plants in a locality well removed from older vines, which are always a source of infection. All old and unprofitable vines should be removed and destroyed, and new areas planted as far away as possible from older vines; if healthy seedlings are planted, their remoteness from old vines will largely determine the profitable length of life of the new plantation.

Tomato spotted wilt on Iceland poppies [*Papaver nudicaule*] [ibid., xiv, p. 129; xvii, p. 96] may be controlled by raising seedlings in beds remote from affected plants and promptly removing and destroying the diseased plants; the hands should be washed in soapy water before touching healthy poppies.

In the second of these papers, the importance of winter treatments against vine anthracnose (*Gloeosporium ampelophagum*) [*Elsinoe ampelina*: ibid., xiv, p. 814; xvii, p. 221] is stated to be frequently overlooked in New South Wales. After pruning, all cuttings (as well as the loose, old bark, if circumstances permit) should be removed and burnt. While dormant, the vines should be sprayed or swabbed once or twice with iron sulphate (5 lb.) and sulphuric acid ($\frac{1}{2}$ pint) in water (1 gal.) or with sulphuric acid (1 gal.) in water (10 gals.). The sulphuric acid is recommended where spraying is carried out, but it is also an effective swab. If only one swabbing is given, it should take place as near as possible to the bursting of the buds, but must not be so far delayed as to injure the buds. If two applications are made, the first should be given a month to five weeks before the buds burst, and the second just before they burst. Swabbing reduces the total amount of infective material on the vines and so minimizes the danger of early infection, while by delaying the bursting of the buds for a week or ten days it is advantageous in areas liable to late frosts.

Oats and wheat are frequently attacked by 'purple patch' (*Rhizoctonia* [*Corticium*] *solani*) [ibid., xiii, p. 295]. Field and glasshouse experiments showed that sulphate of ammonia applied before sowing

at the rate of 1 cwt. per acre to areas previously affected or broadcast at the same rate to affected patches appearing in the crop in July and August gave appreciable control, particularly with oats.

Plant pathology.—*Rep. Hawaii agric. Exp. Sta., 1937*, pp. 35–45, 1938.

Further isolation studies have demonstrated that the *Pythium* species previously reported from Hawaii as associated with soft rot of the taro (*Colocasia esculenta*) corm [*R.A.M.*, xvi, p. 301] is the outstanding etiological agent of the disease. The fungus is quite distinct from *P. graminicolum* [see below, p. 735]. Effective control has resulted from drying and ploughing the soil between the crops. In pot tests 5, 21, and 57 per cent. infection occurred in sterilized soil (the inoculum is believed to have been carried on the planting material), unsterilized soil from a diseased area, and sterilized soil later inoculated with the fungus, respectively; the organism was isolated in every case of infection. Laboratory studies showed that the fungus does not grow readily below P_H 5. Plants in infected soils in pots when given water of P_H 4 and P_H 5 grew at least as well as others given water of different P_H values, showed no rot, and gave 30 per cent. more yield than plants given water at other P_H values. Plants grown at P_H 2, 3, 6, and 7·2 showed 40, 40, 20, and 10 per cent. rot, respectively. When plants were grown in pots of fresh soil from a diseased locality (1) thoroughly sun-dried for three weeks, (2) partially sun-dried, and (3) in its natural condition, only the plants in lot (3) became diseased. Significant reductions in infection were given by soil applications, before planting, of a number of chemicals, including copper sulphate (300 and 600 lb. per acre), lime (2 and 4 tons per acre), borax (50 lb. per acre), formalin (8 per cent. solution, 1 pt. per sq. ft.) and mercuric chloride (10 and 20 lb. per acre). Sulphur applications increased the incidence of rot.

Two corms affected by vascular necrosis yielded a Phycomycete from a small percentage of over 200 isolations made. The fungus is characterized by a slow, submerged growth, and inoculations with it gave a reddening and hardening of the vascular tissue somewhat resembling natural infection. In a varietal resistance test in which 32 varieties were planted in soil from an affected area, Weo No. 2202, Haokea No. 2920, Uahiapele No. 2207, Lehuaapei No. 2109, and Makaopio No. 2204 remained unaffected, while Piko Kea No. 2100, Kai Uliuli, and Miyako were slightly attacked.

Of 45 varieties of taro tested none was resistant to *Phytophtnora colocasiae* and only the Manini Uliuli taro variety to *Phyllosticta colocasiophila*. The West Indian eddoe (*Xanthosoma macrophylla*) is resistant to *Phytophthora colocasiae*, but *Phyllosticta colocasiophila* will infect this host if introduced through a broken epidermis. *Phytophthora colocasiae* can be controlled by spraying at intervals of 10 days with Bordeaux mixture (4–4–50), preliminary data indicating that the spraying increases yields by 15 to 20 per cent.

Bliss Triumph potatoes affected with rugose mosaic, and mild mosaic with and without stunting yielded, respectively, 81·6, 170·3, and 344·5 gm. per plant, as against 428·9 gm. in the case of healthy plants (standard error in each case $\pm$43·2 gm.).

A virus disease of the ring spot type caused a mortality of about 25 per cent. in an experimental planting of tomatoes.

Other records include leaf spot (*Coniothyrium zingiberi*) [ibid., xi, p. 74] and a basal rot due to a species of *Fusarium* on ginger, blight (*P. colocasiae*) of periwinkle (*Vinca* sp.), and rhubarb leaf spot (*Phyllosticta straminella*) [ibid., xiv, p. 7].

McNew (G. L.). **Dispersion and growth of bacterial cells suspended in agar.**—*Phytopathology*, xxviii, 6, pp. 387–401, 2 figs., 1 diag., 1938.

Microscopic examination of duplicate broth subcultures of *Phytomonas* [*Aplanobacter*] *stewarti* [*R.A.M.*, xvii, p. 517] dispersed into nutrient agar containing 0·5 or 1·5 per cent. dextrose showed that an average of 99·2 per cent. of the loci occupied by the bacteria had single cells and 80 to 94 per cent. of these cells multiplied. In plates sown with *Erwinia carotovora*, *Phytomonas* [*Pseudomonas*] *campestris*, *Phytomonas* [*Bacterium*] *phaseoli*, *P. angulata* [*Bact. angulatum*], *P.* [*Pseudomonas*] *savastanoi*, *Phytomonas* [*Pseudomonas*] *pisi*, *Phytomonas tabaca* [*Bact. tabacum*], *P.* [*Bact.*] *pruni*, or *P. translucens* var. *undulosa* [*Bact. translucens* var. *undulosum*], over 97 per cent. of the loci had single cells, which grew very readily in all species except *Bact. translucens* var. *undulosum*. The species *P.* [*Bact.*] *tumefaciens*, *P.* [*Bact.*] *juglandis*, *P. insidiosa* [*A. insidiosum*], and *P. michiganensis* [*A. michiganense*] had only 89 to 97 per cent. of the loci occupied by single cells; an examination of their broth suspensions showed that the pairs and clumps of cells existed before the bacteria were placed in the agar. *P. fascians* [ibid., xvi, p. 321] was the only species to produce many clumps of cells in agar. Using the poured-plate technique, therefore, the single cell origin of most cultures may be guaranteed by making several serial dilutions and single colony isolations, the likelihood that a culture of *A. stewarti*, for example, had not been reduced to a single cell in at least one of five successive dilutions being less than 1 in about 3,500,000,000. If a culture does not produce colonies of single-cell origin it is preferable to use other methods.

Sibilia (C.). **Ricerche sulle ruggine dei cereali. VIII. Prime notizie sulla 'Puccinia graminis tritici' in Africa orientale italiana.** [Researches on cereal rusts. VIII. First notes on *Puccinia graminis tritici* in Italian East Africa.]—*Boll. Staz. Pat. veg. Roma*, N.S., xviii, 1, pp. 67–74, 1938.

Continuing his studies on cereal rusts [*R.A.M.*, xvi, pp. 520, 593], the author made seven monospore cultures of *Puccinia graminis* from native wheat grown at Addis Ababa and three monospore cultures of the same species from native wheat grown at Gondar. When grown on twelve differential wheat varieties in Italy all gave substantially the same type of infection on any particular variety, indicating the presence of only one physiologic race, apparently a new one, which the author refers to for the present as A.O. 1. The new race gave no infection on Reliance, Kota, and Vernal, 3 type infections on Khapli, and 4 or 4–3 on the other test varieties. It is not highly virulent, and alone of all the physiologic races of *P. graminis* so far found on the African continent, is unable to infect Kota wheat.

Vohl (G. J.). **Untersuchungen über den Braunrost des Weizens.** [Investigations on the brown rust of Wheat.]—*Z. Züchț.*, A, xxii, 2, pp. 233–270, 3 figs., 1938.

In two years' investigations at the Institute for Plant Culture and Plant Breeding at Halle 336 single spore lines obtained from 101 collections of *Puccinia triticina* on wheat [*R.A.M.*, xvii, pp. 226, 591] from 49 localities of Germany, Finland, France, Holland, Austria, and Sweden were tested on the standard assortment of 8 differential varieties [ibid., xi, p. 288] and showed the presence of the physiological races 11, 13, 14, 15, 16, 19, 20, 21, and 22, of the races 5, 6, 7, 30, 42, and 77, found for the first time in Europe, and of a new race designated 91. The races 11, 13, 14, 15, 20, 21, and 42 were the most prevalent in Germany. The author disagrees with Scheibe, who classified the races into eastern and western groups [ibid., ix, p. 767], since most of the known races have since been found almost everywhere. It would, however, be advantageous to the plant breeder to reduce if possible the number of races he has to consider. Accordingly the author attempts to divide the European races of *P. triticina* into two groups according to their ability to attack the same test plants, one group comprising the races 11, 14, and 15, capable of attacking the test varieties Malakoff and Carina only slightly or not at all, and another group consisting of the races 13, 20, 21, and 42, attacking these varieties strongly.

The results of field experiments, in which 15 varieties of summer wheat were artificially infected with races 11, 13, 14, and 15 at six different stages of growth, showed the varieties Marquis, Marquillo, Thatcher, D.C. 2305, Hope, H 44, 38 M.A., Garnet, and Reward to be resistant in the field to all the races used. These varieties showed the typical rhythm of field resistance, exhibiting susceptibility in the seedling stage, the beginning of resistance in the shooting stage, high resistance at the time of heading and flowering, and a diminution of resistance in the final stages of vegetation. They are recommended for breeding purposes, as are also the varieties Hard Taganrog, Lin Calel, Mindum, Normandie, and Vencedor, which were resistant to some of the races of *P. triticina* in the seedling stage as well as the later stages in the field, though in the case of other races they showed a return to susceptibility in the later stages of growth in the field. The variety Heine's Kolben was highly susceptible at practically all stages.

Greenhouse inoculations of 917 F_2 progenies from 11 crosses, comprising a total of 39,694 plants, showed that the seedling resistance of the parents Ardito and Varonne was governed by a monomeric recessive factor, and that of the parent Normandie by a monomeric dominant factor. The resistance of Ardito and Varonne to the group of races 11, 14, and 15, and of the varieties Normandie and 3972_{30} to races 14 and 15, was found to be transmitted through one factor. Inoculations of 350 F_1 and 8,638 F_2 wheat plants from 5 crosses of summer wheats with winter wheats and 16 crosses of summer wheats showed the field resistance of the resistant summer wheats Marquis and Thatcher to be transmitted as a monomeric recessive factor in crosses with winter wheats. In two crosses with summer wheats, on the other hand, the resistance of Thatcher was found to be transmitted as a dominant factor to the F_1 and F_2 progenies. The baking quality of the crosses

from Marquis and from Thatcher, determined according to Pelshenke's method, was the same in susceptible as in resistant plants, and it is concluded, therefore, that this character is transmitted independently of rust resistance. In crosses between the varieties Lin Calel, 38 M.A., and Hope with H 44 and Hard Taganrog it was found that the field resistance of H 44 and Hard Taganrog was transmitted as a monomeric dominant factor to the F_1 and F_2 generations. In the hybrids Hope$\times 5676_{33}$ and H $44\times 5676_{33}$ resistance was dominant, but the material available was insufficient for a factorial analysis.

Rodenhiser (H. A.) & Quisenberry (K. S.). **Bunt reaction of some varieties of hard red Winter Wheat.**—*J. Amer. Soc. Agron.*, xxx, 6, pp. 484–492, 1938.

Hard red winter wheats were grown for one to six years during the period from 1931 to 1937 in bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*] nurseries established at ten experiment stations in the Great Plains States and at Kearneysville, West Virginia, St. Paul, Minnesota, and Logan, Utah. Each nursery contained 50 varieties and strains grown in duplicate rows and inoculated with a mixture of collections of the two bunts [*R.A.M.*, xvii, p. 666] obtained from fields selected at random throughout the State in which the trials were conducted.

No variety or selection of the 162 tested proved to be uniformly bunt-free, but a large number may be classed as resistant, 12 contracting an average of under 1 per cent. infection and 84 less than 10 per cent. Among the resistant varieties may be mentioned some grown commercially, such as Ridit, Minturki, Oro, and Yogo, which, together with the Nebraska Turkey selections C.I. 10016 and 10094, are being used as parents for the development of resistant selections. It is apparent from the experimental data [which are tabulated] that most of the resistance in hybrid lines was contributed by Oro, Martin, and Hussar, with the limited participation of Minturki, though some of the physiologic races of the bunts collected in Montana attacked the four varieties in question. Twelve out of 14 strains of Oro$\times$Tenmarq produced less bunt than the former while all were healthier than the latter parent. The Hope variety proved to be less valuable as a progenitor in winter- than in spring-wheat crosses, having been resistant only to 4 out of 11 races of *T. caries* and to none of the 8 of *T. foetens* used. Only 10 out of 50 wheats showed less than 10 per cent. infection by the dwarfing race of *T. caries* [ibid., xvii, p. 505], which is prevalent in Utah and the Gallatin Valley of Montana and occurs also in Washington and Idaho. Factors for resistance to this race are present in Martin, Hussar, Ioturk, and Relief.

Broadfoot (W. C.) & Tyner (L. E.). **Studies on foot- and root-rot of Wheat. VI. Methods of securing infection of Wheat seedlings for study in nutrient solutions.**—*Canad. J. Res.*, Sect. C, xvi, 6, pp. 253–261, 1938.

In further studies on the foot-rot diseases of wheat caused by *Helminthosporium sativum* and *Fusarium culmorum* [*R.A.M.*, xvii, p. 512], the authors devised a satisfactory method of securing uniform

but not too severe infection of wheat seedlings grown in nutrient culture solutions by germinating the seedlings and immersing their roots before transplanting for about seven to ten days in a culture of the fungus grown in a complete nutrient solution to which a 2 per cent. solution of sugar [volume unspecified] had been added. The severity of the infection was easily controlled by delaying the contact with the inoculum and varying the duration of the contact. The technique also appears to be of value for plants transplanted to soil or sand, but this has not yet been demonstrated experimentally. Of all other methods of infection studied the hypodermic injection of spores of the pathogen into the crown tissue of the seedlings, or adding spore suspensions with or without sugar to the nutrient culture solutions at the time of transplanting the seedlings, produced little or no infection, while adding spore suspensions and sugar to the nutrient culture solutions a few days prior to transplantation gave only fairly satisfactory results, and soaking seeds in spore suspension prior to germination caused rather poor and uneven infection.

VANTERPOOL (T. C.). **Some species of Pythium parasitic on Wheat in Canada and England.**—*Ann. appl. Biol.*, xxv, 3, pp. 529–543, 1 pl., 2 figs., 1938.

The author states that by using the recognized method of isolating Phycomycetous fungi from diseased plant roots he succeeded in obtaining six species of *Pythium* from wheat seedling material collected in Saskatchewan, Canada, and in six wheat-growing counties of England, the pathogenicity of which to cereals was studied by him in small Erlenmeyer flasks, as described in his earlier paper [*R.A.M.*, xi, p. 434]. The ease with which the better-known species of *Pythium* could be obtained from wheat seedlings indicated a wide distribution of these forms in England. Of the six species isolated *P. arrhenomanes* in the wider sense of Rands and Dopp [ibid., xiv, p. 94], *P. volutum* [ibid., xi, p. 434; xiv, p. 240], and *P. tardicrescens* n.sp. were found both in Canada and England; *P. graminicolum* [ibid., xi, p. 435; xvii, p. 384] and a form in general agreement with the description of *P. torulosum* [ibid., xiv, p. 240] were found in England alone; and *P. aristosporum* n.sp. was isolated only in Canada. *P. arrhenomanes* is stated to be very widely distributed and probably to cause more damage to Graminaceous crops than any of the other species under consideration. In England two strains of the fungus were obtained, both of which were larger in average spore size than the Canadian type culture and failed to produce (lobulate) sporangia; both proved to be highly pathogenic to Marquis wheat. *P. graminicolum* was isolated from wheat seedlings grown near Cambridge, and was shown to be more pathogenic to Marquis wheat than a strain from sugar-cane received from Drechsler. The English strains of *P. volutum* agree closely with the Canadian type species in general cultural and morphological characters, and are severely parasitic on wheat seedlings.

P. tardicrescens n.sp. is characterized by irregularly branched hyphae, mostly 2·5 to 5 μ broad, with fine laterals, knob-like appressoria being often present. Toruloid buds or a moderate development of lobulations are infrequently produced in old cultures, and are also observed intra-

cellularly in living tissues; the buds are never complex, and rarely exceed 12 μ in diameter. Zoospore discharge was not seen, but germ-tubes are produced which may terminate in a dark conidium. The oogonia are smooth, terminal on short branches or rarely intercalary, and 17 to 30 (average 24·1) μ in diameter; they form readily in plain agar containing wheat root tips or in water root-tip cultures, but more sparsely on the agar medium alone; the delimiting septum is frequently visible below the edge of the oogonium. The antheridia number up to six, but usually two or three; they are club-shaped or crook-necked, and average 6 to 8·5 μ in width, 10·5 μ from apex to curve, and 5·5 μ from curve to septum, with a fertilization tube of 2 μ diameter; they commonly arise from the oogonial stalk or from a branch, but all may come from neighbouring branches, each of which may supply two or, less often, three. The oospores are smooth, spherical or subspherical, usually free within the oogonium, and 16 to 26 μ in diameter (average 20·3 μ), with a central globule and a wall 1·25 to 2 μ thick.

P. aristosporum n.sp. has hyphae 2·5 to 6·5 μ in diameter and numerous appressoria; conidia up to 40 μ in diameter are sometimes present, germinating by one or more germ-tubes, irregular in course and soon branching. Lobulations develop in due course in old water cultures; at first the individual elements are digitate, but in older complexes they are more often swollen lumps. Germination occurs by numerous tubes; zoospore production was not obtained. The oogonia are smooth, subspherical, terminal or intercalary, most often on short side branches, abundant, 21 to 36 (average 28·8) μ in diameter; the septum is usually some distance from the oogonial wall which persists long after the maturation of the oospore. The antheridia are usually three to six, but sometimes as many as eight or more; they are androgynous and diclinous, club-shaped or crook-necked, moderately narrow, 6·8 μ wide by 10·4 μ from point of contact to curve and 6 to 7 μ from curve to septum, frequently entangling the oogonium; a single branch may supply as many as four antheridia. The oospores are smooth, subspherical, deep brown, usually free within the oogonium, abundant on most substrata, 13 to 30 (average 24·2) μ in diameter, with a central globule, and a wall about 1·5 to 2 μ thick; they germinate by one or more germ-tubes. [Latin diagnoses of both these new species are given.]

The English form of *P. torulosum* is stated to be probably in close agreement with the fungus of the *P. gracile* group described by Petri [ibid., x, p. 592] from Italy, and in spite of certain divergences the author thinks it best for the present to consider the English and the Italian forms as geographic strains of *P. torulosum*, even though it may broaden the concept of this species.

While the damage done in England by species of *Pythium* is not known, the fact that species known to be pathogenic to wheat in other parts of the world have been shown to be present in five counties suggests that they account for a reduction in yields of wheat or other cereals which has hitherto been attributed to other causes. Attention is further drawn to the fact that all the parasitic species isolated belong to the group of the genus with lobulate sporangia; numerous sphaerosporangial forms, however, were also isolated, which, while non-pathogenic or only weakly pathogenic, caused a retardation

of growth in the length of the main seminal roots, with the subsequent development of an excessive number of fine laterals, possibly owing to some toxic product excreted by the fungus; it is suggested that these forms may render the wheat seedlings more liable to attack by the pathogenic forms.

BOEWE (G. H.). **Tiny toadstools on crop plants in Illinois.**—*Trans. Ill. Acad. Sci.*, xxx, 2, pp. 103–104, 3 figs., 1937. [Received May, 1938.]

Marasmius tritici, first recorded on wheat in Illinois by P. A. Young in 1925 [*R.A.M.*, iv, p. 474], has also been collected in the State on oats, rye, barley, and *Agropyron repens*. Cereals are also colonized by species of *Naucoria* [ibid., xvii, p. 380]. *M. pyrinus* has been observed on a pear leaf attacked by a leaf-mining insect, and probably the same organism is responsible for a peculiar apple canker produced by the splitting and rolling of the outer bark of the smaller twigs through pressure exerted by the formation in the inner bark of a stromatic cushion giving rise to the sporophore. The stipe of the fungus on living apple twigs is filiform and about 3 mm. long, and the pilei are minute, membranous, and paler-coloured on the under surface.

NATTRASS (R. M.). **Diseases of cereals. V.**—*Cyprus agric. J.*, xxxiii, 2, pp. 58–60, 2 figs., 1938.

A brief, popular note is given on barley leaf stripe (*Helminthosporium gramineum*) which, though less widely distributed locally than *H. teres*, is one of the most destructive diseases of barley in Cyprus. Control is recommended by seed disinfection either with formalin solution or with a proprietary organic mercury dust.

BROWN (M[ABEL] R.). **A study of crown rust, Puccinia coronata Corda, in Great Britain. II. The aecidial hosts of P. coronata.**—*Ann. appl. Biol.*, xxv, 3, pp. 506–527, 1 pl., 1 diag., 1938.

Continuing her studies on *Puccinia coronata* [*P. lolii*: *R.A.M.*, xvii, p. 23; cf. also p. 233] the author describes experiments in which she inoculated seedling plants of *Rhamnus frangula* and *R. cathartica*, the two aecidial hosts of the rust in Great Britain, with sporidia from germinating teleutospores collected on a number of grasses, and the grasses with aecidiospores collected in the field on the two species of *Rhamnus*. The results of the first series of tests indicated a considerable degree of specialization of the different varieties of *P. coronata* [loc. cit.], inasmuch as the varieties *alopecuri*, *arrhenatheri*, *avenae*, *festucae*, *holci*, and *lolii* caused infection and produced mature aecidia on *R. cathartica* alone, and the variety *calamagrostidis* only on *R. frangula*; in one experiment, however, the teleutospores of the last-named, collected on *Phalaris arundinacea*, also infected the leaves of *R. cathartica*, but the spermogonia were small and abortive and there were no aecidia. The fact that teleutospores collected in Canada on *Calamagrostis canadensis* when inoculated on to *R. cathartica*, *R. frangula*, and *R. alnifolia* produced aecidia only on the last-named, is held to indicate that the variety of *P. coronata* infecting this grass in Canada differs from that infecting the same genus in Great Britain in its aecidial, as well as in some of its uredinial hosts.

In the grass inoculations series, *Lolium perenne*, *Holcus lanatus*, *Alopecurus pratensis*, *Arrhenatherum avenaceum*, and *Festuca elatior* were infected by aecidiospores from *R. cathartica*, but not from *R. frangula*, and evidence was obtained that the aecidiospores from the former belonged to the varieties *lolii*, *holci*, *arrhenatheri*, and *alopecuri*. *Calamagrostis lanceolata*, *Phalaris arundinacea*, and *Dactylis glomerata* were infected by the aecidiospores from both *Rhamnus* species; on the two first-named grass species the heaviest infection was produced by the inoculum from *R. frangula*, and on the last-named by that from *R. cathartica*; the aecidiospores from the former were shown to belong to var. *calamagrostidis*, but no conclusion could be arrived at in regard to the varieties composing the inoculum from *R. cathartica* which caused slight infection on *C. lanceolata* and *P. arundinacea*. In the case of *D. glomerata* the aecidiospores from *R. cathartica* were found to belong to var. *lolii*, but insufficient material precluded the identification of the variety from *R. frangula* responsible for infection on this grass. *Agropyron repens*, *Bromus sterilis*, and *Agrostis palustris* gave no pustules with aecidiospores from the two species of *Rhamnus*, but the inoculated leaves were usually flecked.

Inoculation tests with aecidiospores from both species on a number of oat varieties in 1933 and 1934 only resulted in a slight infection of the plants, apparently owing to the absence in the aecidial inoculum of the appropriate variety of rust. Spores produced on Fyris oats by aecidiospores from *R. cathartica* were found to belong to the variety *alopecuri*, and those produced on White Cross by aecidiospores from *R. frangula* to var. *calamagrostidis*.

These results are considered to indicate that the difference in aecidial host relationship of the rust varieties is not an adequate criterion for their differentiation as species; it is suggested that the use of the names *P. coronata* Kleb. and *P. coronifera* Kleb. (*P. lolii* Niels.) be discontinued, and the rust be designated by the original name *P. coronata* Corda.

In a final set of experiments it was shown that passage through the alternate host did not appreciably alter the pathogenicity of the rust varieties, and that the latter did not appear to hybridize readily.

REED (G. M.). **Influence of the growth of the host on smut development.** —*Proc. Amer. phil. Soc.*, lxxix, 2, pp. 303–326, 4 figs., 1938.

This is an expanded account of the writer's studies at the Brooklyn Botanical Garden, New York, on the influence of changes in the growth habit of certain strains of oats, conditioned by nutritional and environmental factors, on the expression of smut (*Ustilago avenae* and *U. levis* [*U. kolleri*]) infection, a preliminary report on which has already appeared [*R.A.M.*, xvi, p. 446].

ITZEROTT (DOROTHEA). **Über Keimung und Wachstum von Ustilago zeae (Beckm.) Ung. mit besonderer Berücksichtigung der Infektion.** [On the germination and growth of *Ustilago zeae* (Beckm.) Ung. with special reference to infection.]—*Phytopath. Z.*, xi, 2, pp. 155–180, 1938.

The results of the author's experiments on the germination of spores of *Ustilago zeae* [*R.A.M.*, xvii, p. 387] showed that the spores germi-

nated best at P_H 4·4, but that the germination gradually decreased with an increase of acidity and was finally arrested at P_H<2·5, irrespective of the age of the spores. A decrease of acidity beyond P_H 4·4 resulted in the gradual decrease and final inhibition of germination of old spores at P_H>8·55, while the germination of young spores was unimpaired. A similar dependence on the P_H values was found to exist in the formation of sporidia and in the growth of the fungus, the inhibition point for the formation of sporidia lying at a slightly lower acidity, namely, P_H<2·8. The addition of very small concentrations of arsenic, copper, or mercury to the cultural media completely arrested the germination of spores and the formation of sporidia in the following order of toxicity: As>Cu>Hg. Great fluctuations of temperature were unfavourable to the formation of sporidia only at high hydrogen ion concentrations (P_H<5·02) and it is concluded that the slight fluctuations usual for Germany are unlikely to have any effect at all. The isoelectric point of the cell contents of the sporidia is thought to lie between P_H 2·5 and 3·3 and this property may possibly prove to have some importance in connexion with infection. Investigating the modes of infection the author found that infection through the soil was only of small importance, for although the plants often became infected through the soil, they very seldom developed galls. Attempts to produce artificial infection of maize plants by means of injections or by dripping spore suspensions, mixed with different concentrations of fish-oil soap to reduce the surface tension, into the leaf whorls were not very successful, although the second method combined with wounding and applied to very young seedlings promises to give good results eventually. When the plant tissue situated between two galls was examined, no mycelium was detected, suggesting that the infection with *U. zeae* remains local.

Vohl (G. J.). **Mehrjährige Beobachtungen über den Einfluss äusserer Bedingungen auf den Befall des Maises mit Beulenbrand (Ustilago zeae).** [Several years' observations on the influence of external conditions on the infection of Maize by smut (*Ustilago zeae*).]—*Pflanzenbau*, xiv, 12, pp. 465–480, 1938.

A tabulated account is given of the experimental observations made from 1933 to 1937 on the influence of environmental conditions on maize smut (*Ustilago zeae*) in the continental climate of Landsberg a. d. Warthe, Germany [see preceding abstract].

On the basis of varietal reaction tests three groups were distinguished, viz., (1) highly susceptible, represented by the early ripening Chiemgau and Mecklenburg (average infection for the five years 24·2 and 19·1 per cent., respectively); (2) moderately susceptible comprising the early varieties Pfarrkirch, Mahndorf, and Dr. Delille's Early, and the medium-early Giersdorf, Döbeln, Pautzfeld, and Domentzko (12·1, 11·1, 11·5, 16·4, 15·6, 10·8, and 10·2 per cent., respectively); and (3) somewhat resistant, including the medium-early Dr. Delille's Seed Maize, and Pomerania and the 'normal' maturing Janetzki, Yellow Baden, and Caspermeyer's II (7·6, 6·9, 6·4, 7·5, and 9·1 per cent., respectively).

Close planting uniformly reduced the incidence of infection: the

spacing recommended is 60 by 20 cm. for early, 60 by 25 cm. for medium-early, and 60 by 30 cm. for 'normal' maturing varieties. In a test with Pomeranian maize in 1936 the incidence of smut among plants from seed sown on 10th, 20th, and 30th April and 10th May was 13·8, 11, 8, and 6·7 per cent., respectively, the corresponding figures for the same variety and identical sowing dates in 1937 being 10·8, 8·7, 5·7, and 5·1 per cent., respectively. The maximum yield in 1936 (5,276 kg. per hect.) was obtained from the 20th April sowing and in 1937 (5,930 kg. per hect.) from that of 30th April. In a test on the Pomeranian variety in 1935 the incidence of *U. zeae* rose parallel with increasing applications of nitrogen fertilizer to the soil, 50·8, 53·1, and 61·3 smutted plants per sq. m. being counted on the plots receiving the equivalent of 40, 60, and 80 kg. of pure nitrogen per hect., respectively. A similar relationship was observed in 1937 when the smut percentages in plots receiving 0, 40, 60, and 80 kg. nitrogen per hect. were 5·1, 6·2, 6·9, and 8·9, respectively.

ELLIOT (CHARLOTTE). **Bacterial wilt of Sweet Corn in Mexico.**—*Phytopathology*, xxviii, 6, pp. 443–444, 1938.

In December, 1937, the author found lesions similar to those typical for bacterial wilt on the leaves of green maize, growing in the more tropical sections of Orizaba, Oaxaca, and Jalapa, Mexico. Yellow bacterial colonies with growth characters typical of *Aplanobacter stewarti* [see above, p. 732] were obtained from these lesions and inoculations resulted in the production of the typical wilt symptoms on young sweet maize plants in the greenhouse. Some of the diseased green maize plants at Orizaba showed insect feeding injuries similar to those caused by *Chaetocnema pulicaria*, the common vector of the disease in the United States, and a few small flea-beetles collected from these plants were identified as *C. pulicaria*. It is concluded that the disease observed in Mexico is identical with the bacterial wilt in the United States.

SHIH (L.). **Über den Heterothallismus des Staubbrandes, Sphacelotheca cruenta (Kühn) Potter, der Mohrenhirse, Andropogon sorghum Brot.** [On the heterothallism of loose kernel smut, *Sphacelotheca cruenta* (Kühn) Potter, of Sorghum (*Andropogon sorghum* Brot.).] —*Arch. Mikrobiol.*, ix, 2, pp. 167–192, 9 figs., 1 graph, 1938.

Loose kernel smut of sorghum (*Sphacelotheca cruenta*) [*R.A.M.*, xvii, p. 453] was collected in the autumn of 1935 from no fewer than 25 localities in northern China, and the author here fully describes his studies on this material.

The spores of the fungus germinate at a temperature range of 8° to 38° C. with an optimum at 28° to 32°. Generally speaking, the production of hyphae is favoured by relatively high temperatures, while the normal form of germination with promycelium and sporidia occurs at a lower range. Irrespective of temperature, however, spores germinating in malt solution produce exclusively sporidia, while hyphae invariably develop in distilled water. The behaviour of single sporidia of *S. cruenta* corresponded with that of the spores. On an old potato glucose medium the fungus formed a kind of resting spore consisting of several large, thick-walled cells and measuring 40·5 by 5·2 μ compared

with 14 by 3 μ for the ordinary sporidium. The resting spores were still viable to the extent of 5 per cent. after three months in artificial culture, by which time the sporidia have lost all power of germination.

The examination of 119 monosporidial isolations of *S. cruenta* showed the fungus to be sexually bipolar, with sex-determining factors in the ratio of 2 : 2. By means of Dickinson's method [ibid., vi, p. 309] it was possible to separate the four sporidia of a germinated spore. The use of Bauch's medium (20 gm. commercial malt extract, 15 gm. agar, and 1 l. water) revealed the segregation of the bipolar sex factors of the four sporidia (which are entirely independent of those governing cultural characters) in the first reduction division. Hyphal anastomoses, even between lines of the same sex, promote the luxuriant development of the fungus. The hyphae proceeding from single sporidia are simple, straight, and branched at acute angles, whereas those emanating from the union of heterosexual sporidia are undulating, curly, and furnished with small apical disks. A simple method was devised for the observation of the fusion process in heterosexual hyphae on 2 per cent. glucose agar, on the surface of which the sporidia of different sexes in aqueous suspensions were arranged in alternating streaks with a space of 2 to 5 mm. between each. Under these conditions both the chemotropic attraction of the heterosexual hyphae and the spiral branches resulting from their union were clearly apparent.

In seedling inoculation experiments the monosporidial lines caused no infection and the crossed lines very little. Wounded plants were more susceptible to infection than uninjured ones, and though the epicotyl was the most accessible organ, in 47·4 per cent. of cases smut resulted from inoculation of the radicle, ordinarily regarded as immune. Hypodermic injections of germinated spores in the hyphal phase produced more intensive infection than those in the sporidial phase; while similar injections of monosporidial origin in both phases failed.

Reichert (I.). **A decade of research into Citrus diseases in Palestine.**—Reprinted from *Hadar*, xi, 1, 10 pp., 1938.

In this review of work carried out on citrus diseases in Palestine during the last ten years the author deals in turn with conditions affecting seed-beds, nurseries, trees, and fruits, and concludes by referring to local problems on which research is indispensable in the near future.

Hall (E. G.). **Australian Citrus fruits. Handling and storage in relation to wastage.**—*J. Aust. Inst. agric. Sci.*, iv, 2, pp. 85–95, 1 fig., 1938.

Much of the subject matter of this paper is based on the three years' investigations into the problem of wastage of citrus conducted jointly by the Citrus Preservation Committee of the Commonwealth Council for Scientific and Industrial Research and the New South Wales Department of Agriculture [*R.A.M.*, xvii, p. 444]. The wastage of citrus due to fungal activity is attributed mainly to the green and blue moulds (*Penicillium digitatum* and *P. italicum*) and to *Phomopsis* [*Diaporthe*] *citri*, *Diplodia natalensis* [ibid., xvii, p. 310], *Alternaria*, and *Botrytis* spp. all causing stem end rots. *Alternaria* spp. also cause a black centre rot of mandarins and navel end rot of navel oranges.

Button rots, confined superficially to a small area around the buttons, are associated with *Colletotrichum*, *Alternaria*, and *Fusarium* spp. and occur during storage at high temperatures and after cool storage at 45° F. and below. *Phoma citricarpa* [ibid., xvi, p. 601], *Septoria citricola* [ibid., xv, p. 89], and *Colletotrichum* spp. cause rind spots. Of the non-parasitic rind disorders storage spot is most common at temperatures from 37° to 45°, while another type of injury, called cold scald, occurs at temperatures approaching freezing point. The latter consists in the formation of a relatively large superficial or slightly sunken area, lighter in colour than in storage spot, and slightly pitted.

The following methods are recommended to reduce wastage in storage. Pruning out dead wood, spraying, and good orchard cultivation are particularly important for the control of stem end rots; during picking gloves should be worn and every care taken to avoid mechanical injury; a layer of wood wool should be placed at the bottom of the field boxes. Recent experiments have shown that, after picking, sweating for several days at 70° or for a few hours at 100° at a low humidity may be effective in controlling storage spot of Navel oranges. In processing the fruit a 1 per cent. solution of a mixture of sodium metasilicate and soap powder was found to be a good detergent; borax in concentrations of 5 to 8 per cent. at 110° to 120° F. gave consistent control of *Penicillium digitatum*, and reduced the incidence of stem end rots but was relatively ineffective against *P. italicum*. A solution of caustic soda (1 per cent.) or sodium bicarbonate (3 per cent.) gave good control of *P. italicum* but not of *P. digitatum*. Experimental processing of mature fruit at 115° for three minutes was not found to cause injury. Waxing the fruit by the 'hot fog' method proved to be satisfactory on a commercial scale. In local experiments the use of bituminized paper 'Sisalkraft' and of cellophane case liners gave good results in wrapping fruit treated with borax. Although fungal wastage increases with increasing maturity of the fruit at picking time, navels should not be picked before June and Valencias not before September because of the low palatability and susceptibility to storage spot. The best picking time for mandarins from the Hawkesbury River is early June. The best storage temperatures were found to be 50° for grapefruit, 40° for untreated mandarins, 45° for Valencias, and 45° for the early June picked and 40° for the later picked navels.

Kursanoff (L. I.) & Alexeyeva (Mme T. S.). Голубая и зеленая плесень на плодах Цитрусовых. [Blue and green moulds of Citrus fruits.]—*Sovetsk. Subtrop.*, *1938*, 4, pp. 73–77, 1938.

A brief account is given of the authors' studies on *Penicillium digitatum* and *P. italicum* [*R.A.M.*, xvii, p. 311] in pure culture on synthetic media, the results of which showed that for the first-named the minimum P_H for growth was between 2·5 and 3·68, the maximum between 6·8 and 7·42, and the optimum about 5, the corresponding values for the second being between 2 and 2·7, above 6·9, and between 2·95 and 4·64 (the heaviest growth was obtained at 3·3). Of the sugars tested both fungi made best use of fructose and galactose; they were also able to use citric acid as a source of carbon, but not acetic or oxalic acids. Organic nitrogen compounds, and more particularly peptone, proved to

be the best source of nitrogen for both organisms; nitrates were also used to a smaller extent, but ammonium salts were the least available, especially for *P. digitatum*. In experiments in which lemon and tangerine fruits were inoculated through surface wounds with *P. italicum*, the fungus was shown to reduce the saccharose content of tangerines from 21·54 per cent. in the healthy fruit to 10·34 per cent. in the half-invaded, and to 0·4545 per cent. in the fully rotted, and in lemons from 4·546 to 2·35 and 0·895 per cent., respectively. The citric acid content of lemons was also found to be considerably reduced in fully invaded fruits, the value of which for industrial use is therefore greatly lowered. A brief review is appended of control measures recommended in the foreign literature for the control of both blue and green moulds of citrus fruits, which are stated to be very common in the U.S.S.R.

Nunes (D.). **Duas novas espécies para a flora micológica lusitana.** [Two species new to the Portuguese mycological flora.]—*Broteria*, vii, 2, pp. 51–54, 2 figs., 1938.

Oospora citri-aurantii is recorded on lemons and citrons [*R.A.M.*, xvii, p. 310] for the first time in Portugal.

Parker (E. R.). **Progress in mottle leaf control.**—*Calif. Citrogr.*, xxiii, 8, pp. 334, 367, 1 fig.; xxiii, 9, pp. 392–393, 1 fig., 1938.

The results of experiments initiated in 1934 and 1935 at the Citrus Experiment Station, Riverside, indicate that zinc treatment of citrus trees [*R.A.M.*, xvii, p. 596] showing severe symptoms of mottle leaf may result in increased crops of good quality fruit, while mildly affected trees would show no response. Sprays containing zinc compounds in concentrations equivalent to about 1·15 lb. of zinc to 100 gals. of water gave the best control; the effect of spraying lasted for two or three years, and was equally good when the spray was applied at various seasons. For commercial spraying zinc sulphate and zinc oxide are recommended in the following combinations: 5 lb. zinc sulphate (containing 23 to 25 per cent. zinc), 2·5 lb. either hydrated lime or soda ash as precipitants, and 100 gals. water; or $1\frac{1}{3}$ lb. zinc oxide (containing not less than 75 per cent. zinc) and 100 gals. water. Spreaders did not appear to be necessary with these sprays. Zinc oxide incorporated with lime-sulphur is described as a feasible combination spray. In parallel trials zinc dusts proved to be less effective than zinc sprays; none of the dust combinations showed complete control although they may prove quite satisfactory in maintenance treatment of only slightly affected trees. The effect of the dusts was not improved by the addition of 5 per cent. oil or blood albumen as stickers. The zinc dust is most frequently incorporated with sulphur in the usual pest control programme; the cost is therefore slight, and frequent repetition of the treatment is possible. Metallic zinc dust, precipitated zinc sulphide, and zinc oxide derived from high-grade roasted and well-ground ore, were equally good materials for use in dusts. The commercial zinc-sulphur dusts should contain about 5 per cent. zinc oxide and 93 per cent. of sulphur.

[A full account of the work described in this paper appears in *Proc. Amer. Soc. hort. Sci.*, xxxv, pp. 217–226, 1938.]

Morris (A. A.). **Some observations on the effects of boron treatment in the control of 'hard fruit' in Citrus.**—*J. Pomol.*, xvi, 2, pp. 167–181, 2 pl., 1938.

Further investigations [which are described, and the results of which are tabulated] carried out in Southern Rhodesia into the serious and widespread physiological disease of citrus known as 'hard' fruit [*R.A.M.*, xvi, p. 528] showed that the boron content of Valencia Late orange fruits was increased by boron applications to the trees (made in the form of top dressings of powdered borax applied at rates ranging from 100 to 1,000 gm. per tree, and aqueous solutions of borax used at 25 to 250 gm. per tree), and that 'hard' fruit symptoms were associated with a low boron content of the fruit. It was also found that the intake by young orange fruits of the common nutrient elements (except, possibly, nitrogen) was not affected by the treatment, though sugars and pectins were lower in fruits deficient in boron than in fruits from trees receiving relatively light boron applications. There was some evidence that high boron treatment retarded the translocation of sugars to the fruit.

Chemical analysis of the ash content of orange leaves from these areas showed that treatment increased the boron content of very young leaves from 5·8, 4·6, and 4·6 parts per million of boron in the dry matter, to 34·2, 76·7, and 28·3 p.p.m., the amount of boron in each sample being roughly proportional to the amount of borax applied; the figures for the mature leaves, untreated, were 11·3, 8·7, and 6·1, as against 95·5, 240, and 41 p.p.m. for the treated. The leaves from severely affected, untreated trees (picked at random in the groves) contained only 4·3 to 11·3 p.p.m. of boron in the dry matter, as against 8·4 to 12·8 p.p.m. of boron in leaves from slightly affected trees, and 14·5 to 18·4 p.p.m. in those from healthy trees.

The total yield obtained from six trees given 50 to 500 gm. of borax was 10,411 fruits, all unaffected, and potentially marketable, as against 4,627 fruits with 3,839 affected from the six untreated controls, i.e., a potential commercial crop of only 788 fruits.

Maturity test data indicated that the boron treatment increased the percentage of juice and soluble solids in mature fruit but delayed the maturing process.

Bliss (D. E.). **Two new species of Omphalia which cause decline disease in Date Palms.**—*Mycologia*, xxx, 3, pp. 313–326, 9 figs., 1 graph, 1938.

Cultures of two species of *Omphalia*, considered to be the cause of decline disease of date palms [*R.A.M.*, xvii, p. 29] were isolated at the Citrus Experiment Station in California from the roots of diseased palms. These fungi do not commonly fruit in the open but a group of 65 toadstools was found at the base of a young Saidy date palm four days after a torrential rainstorm followed by hot and humid weather. Sporulation was induced on inoculated seedlings of *Washingtonia filifera* in the greenhouse, temperatures between 26° and 31° C. and a relative humidity of 92 to 98 per cent. being favourable to its development. The author gives Latin diagnoses and descriptions of the two new

species as follows. *O. pigmentata* n.sp. is typified by abundant, white, silky, rather coarse mycelium resembling glass wool and producing a light orange-yellow to cadmium-orange pigment when grown at 20° to 30° on slants of 2 per cent. potato dextrose agar. The pileus is 5 to 33 mm. broad, pale orange-yellow approaching white with age; the stipe is 5 to 35 mm. long and 0·5 to 2 mm. in diameter; the lamellae are short-decurrent, thin, distant, sometimes branched, very pale orange-yellow to white; the basidia are hyaline and measure 19 to 25 by 5 to 8 μ; and the sporidia are hyaline, oval, papillate, and measure 6 to 9 by 4 to 6·5 μ. *O. tralucida* n. sp. has a white mycelium, finer in texture, and the reverse side of the culture may develop a brown to black discoloration. The pileus is white and then cartridge-buff and 3 to 18 mm. broad; the stipe is 4 to 23 mm. long and 0·3 to 1·7 mm. in diameter; the lamellae are short decurrent, sometimes attached only slightly, thick when young, becoming thinner, distant, branched, intervenous, unequal, white; the basidia are hyaline and measure 32 to 46 by 6 to 12 μ; and the sporidia are hyaline, white in mass, fusiform-ellipsoidal, papillate, and measure 11 to 16 by 3 to 6 μ.

Franssen (C. J. H.) & Muller (H. R. A.). **Plagen en ziekten van Katoengewas op Java.** [Pests and diseases of the Cotton crop in Java.]—*Landbouw*, xiv, 5–6, pp. 321–362, 3 pl., 1938. [English summary.]

The only serious disease of cotton in Java is stated to be blackarm (*Pseudomonas* [*Bacterium*] *malvacearum*), which generally appears to originate in imported seed and chiefly attacks second-year crops. Control should be based on strictly annual cultivation, the postponement of replanting until the remains of the preceding crop have undergone decomposition, and seed treatment with sulphuric acid and 0·2 per cent. mercuric chloride [full directions for which are given by the Phytopathological Institute on pp. 388–389].

Schaefer (E. E.). **Locust fungi.**—*Pamphl. S. Afr. biol. Soc.* 9, p. 21, 1937. [Received August, 1938.]

In a paper read before the South African Biological Society on 16th July, 1936, the author stated that when an aqueous solution of the spores of *Beauveria bassiana* [cf. *R.A.M.*, xv, p. 425; xvi, pp. 68, 531] was sprayed on to locusts in South Africa, nearly all the insects succumbed, if kept in incubators at 78° to 80° F. When kept in cages at the laboratory, only 17 per cent. of the inoculated insects died, while in enclosures in the field only 12 per cent. died as a result of infection. The fungus cultures had no effect on insects in their natural environment, and it is concluded that *B. bassiana* can attack only those locusts whose health has become impaired.

All attempts to cultivate *Empusa grylli* [ibid., xv, p. 216] on artificial media from spores about a fortnight old failed, and it was also found impossible to infect living locusts with the spores. Out of 1,073 hoppers dying of infection in the field, 489, or 47 per cent., contained maggots or nematodes, while of an equal number of apparently healthy locusts only 1·6 per cent. showed similar infestation. It is therefore concluded

that *E. grylli* is able to kill only those locusts whose natural resistance is below normal.

Hopkins (J. G.). **Ringworm and moniliasis : their differential diagnosis.** —*Penn. med. J.*, xli, 6, pp. 455–472, 24 figs., 1938.

This is a useful survey of the available information on ringworm, moniliasis, and a few pathological conditions of minor importance. Of 6,515 patients examined for skin diseases at the Vanderbilt Clinic, New York, in 1936, at least 5 per cent. were definitely affected with dermatomycoses. The predominating fungi associated with ringworm were *Microsporon audouini* [*R.A.M.*, xvii, p. 680] and *M. felineum* [ibid., xvii, p. 175; xvii, p. 680] (mostly on the scalp) and *Trichophyton mentagrophytes* [ibid., xvii, pp. 599, 680] (largely confined to the feet), while *Monilia* [*Candida*] *albicans* [ibid., xvii, p. 677] was morphologically and serologically established as the agent of paronychia, perlèche [ibid., xvii, p. 528], and other cutaneous disturbances.

Joyeux (C.) & Sautet (J.). **Influence de la carence en vitamine A sur l'évolution de la teigne à 'Microsporon felineum'.** [The influence of vitamin A deficiency on the development of ringworm due to *Microsporon felineum*.]—*Bull. Soc. franç. Derm. Syph.*, xlv, 6, pp. 1038–1040, 1938.

The development of ringworm experimentally induced in guinea-pigs by inoculation with a pleomorphic culture of *Microsporon felineum* [see preceding abstract] showed the following tendencies when vitamin A was withheld from the dietary: accelerated extension of the pathogen, exacerbation of the cutaneous reactions, and increased susceptibility to infection as compared with animals supplied with the accessory growth substance.

Kambayashi (T.). **Eine Studie über die systematische Stellung der Trichophyton-Arten. (Soll das Trichophyton lacticolor der Familie 'Gymnoascaceae' eingereiht werden?)** [A study on the systematic position of species of *Trichophyton*. (Should *Trichophyton lacticolor* be included in the family Gymnoascaceae?).]—*Bot. Mag., Tokyo*, lii, 618, pp. 291–297, 6 figs., 1938.

The author was able to observe the formation of asci on a culture of *Trichophyton lacticolor* [*R.A.M.*, xi, p. 784; xvii, p. 176] isolated from an eczema marginatum on a man. The fungus was grown on a drop of agar containing 4 per cent. glucose and 1 per cent. peptone placed on a glass slide and incubated in a moist chamber at 27° C. After 50 hours the ascogonium and the antheridium were found to grow from two neighbouring cells of a hypha. They were very similar in shape, the antheridium being slightly wider and more erect, while the ascogonium wound itself round it in a spiral. A migration of the nuclei could not be observed. The ascogonium divided into many binucleate cells, which eventually developed into ascogenous hyphae and coiled themselves up round the original spiral. In this mass eight-spored asci measuring 11 to 12 by 8·5 to 10 μ in diameter, containing ascospores measuring 3 by 3 to 3 by 6 μ, were found to have developed, and frequently asci with four spores, but the process of formation could

not be followed. Owing to its many points of resemblance to *Gymnoascus reessii* and *Ctenomyces serratus* it is concluded that *T. lacticolor* should be regarded as belonging to the Gymnoascaceae.

Jausion, Hyronimus, & Kouchner. **Eczéma mycosique des ébénistes.** [Mycotic eczema of cabinet-makers.]—*Bull. Soc. méd. Hôp. Paris*, Sér. 3, liv, 19, pp. 953–962, 1938.

Clinical details are given of a case of generalized eczema in a Polish cabinet-maker in Paris due to *Epidermophyton floccosum* [*R.A.M.*, xvii, p. 599], which was isolated in pure culture on Sabouraud's agar and honey water.

Hanan (E. B.) & Zurett (Sophia). **A new species of Madurella: isolation and identification in a case of maduromycosis.**—*Arch. Derm. Syph., Chicago*, xxxvii, 6, pp. 947–966, 9 figs., 1938.

This is a very detailed account of the clinical features of a case of maduromycosis, following the penetration of the left foot by a splinter of wood, in a 36-year-old Indian native resident for 18 years in the United States, and of the cultural and morphological characters of the fungus, *Madurella lackawanna* n.sp. [without a Latin diagnosis], isolated from the diseased tissues.

Growth is successful only on Sabouraud's medium, dextrose agar, and glycerine agar enriched with liver infusion, the last-named apparently containing some factor essential for the development of the organism. The mycelium is white or smoky-grey, with a white peripheral zone in older cultures. The fungus forms coarsely granular hyphae ranging from 1 to 5 μ in diameter, nodular organs, consisting of arthrospores with square-cut ends, and double-walled chlamydospores, 15 to 30 μ in diameter and usually filled with a brown, granular substance. The optimum temperature for its development lies between 20° and 37° C. *M. lackawanna* does not liquefy gelatine, digest milk proteins or fat, or ferment milk lactose. A black pigment was formed in abundance as the chlamydospores reached maturity, but discoloration of the medium took place only in the presence of liver. Negative results were given by animal inoculation experiments.

Carrión (A. L.) & Pimentel-Imbert (M. F.). **Chromoblastomycosis in the Dominican Republic.**—*Puerto Rico J. publ. Hlth*, xiii, 4, pp. 522–530, 5 pl., 1938. [Spanish translation pp. 531–539.]

Full clinical details are given of a case of chromoblastomycosis, believed to be the first in the Dominican Republic, in a 60-year-old coloured man, and of mycological studies on the associated fungus, *Hormodendrum pedrosoi* [*R.A.M.*, xvii, p. 598]. Sporulation was mostly of the *Hormodendrum* type; spore clusters of the *Acrotheca* type were not uncommon, but frequently became catenulate; and there was a sparse formation of *Phialophora*-like conidia. Medlar's 'sclerotic cells' (spherical, thick-walled, deeply pigmented, often septate cells, 8 to 13 μ in diameter) were produced to a slight or moderate extent in older cultures.

Servazzi (O.). **Intorno ad un caso di disseccamento osservato su Araucaria.** [On a case of drying-up observed on *Araucaria*.]—*Boll. Lab. sper. R. Oss. Fitopat. Torino*, xv, 1–2, pp. 34–47, 2 pl., 1938. [French, German, and English summaries.]

In the spring of 1938 a number of 4- to 6-year-old potted *Araucaria excelsa* plants rapidly withered and died. The lowest branches were affected first and the disease gradually spread upwards. The extremity of the affected branches bent downwards, and later the whole branch became similarly affected. After the death of the branches the stem dried up from the top downwards. Robust, 5-year-old plants succumbed in less than one month.

Affected material showed the presence of a fungus with subepidermal, globose, blackish perithecia up to 350 μ in diameter, with a beak 200 to 250 by 60 to 80 μ, lined with periphyses up to 60 μ long. The fusiform, slightly curved asci measured 120 to 150 by 15 to 18 μ, were somewhat pointed above and below, and contained eight hyaline, filiform, generally curved ascospores with somewhat pointed ends, measuring 85 to 100 by 3 to 4·5 μ, and arranged in a single fusoid bundle. The young ascospores were unicellular, and the old ones 3- to 12-septate. No paraphyses were present. The young asci were pedicellate, but the pedicel rapidly disappeared, and in mature perithecia the cavity was filled with free asci.

On the thin branches and leaves the perithecia were sparse, whereas on the stem and thick branches they were generally gregarious, and joined at the upper part of the beaks by a disk-shaped pseudoparenchymatous stroma consisting of dark, yellowish-fuliginous parallel hyphae connate with those of the beak. These disks, usually distinctly differentiated from the substratum, developed under the cuticle, which they raised and finally ruptured. They were sometimes over 1 mm. broad, up to 200 μ thick, and united 5 to 8 perithecia. The fungus is named *Cryptospora longispora* n.sp., with a Latin diagnosis.

In culture on malt agar it formed a whitish, flocculent colony which grew rapidly, and gradually turned nearly black, the aerial mycelium becoming fuliginous. After 20 days numerous rudimentary perithecia were present but these failed to mature, and similar colonies, with pseudosclerotia, formed on potato agar. Mature perithecia developed on peptone-pepsin-soy agar, rice agar, and apple stems; they were papillate, instead of beaked, except on the last-named. Inoculation experiments on young, healthy, wounded *A. excelsa* plants gave positive results, demonstrating that the fungus is a virulent wound parasite.

Dowson (W. J.), Moore (W. C.), & Ogilvie (L.). **A bacterial disease of Begonia.**—*J. R. hort. Soc.*, lxiii, 6, pp. 286–290, 3 pl. (facing pp. 269, 284, 285), 1938.

Winter-flowering begonias in various parts of England have been suffering during the last few years from a bacterial disease characterized by symptoms closely similar to those reported on the same host from the Continent [*R.A.M.*, xvii, p. 602]. Numerous popular varieties are affected, among the most susceptible being Clibran's Pink, Altrincham Pink, and Optima, while considerable resistance is shown by Ege's

Favourite, Exquisite, Pink Perfection, Fascination, Star, and Flambeau; Gloire de Lorraine and summer-bedding varieties of the *Begonia semperflorens* type do not appear to contract infection.

The bacterium isolated from the diseased tissues was inoculated into healthy plants by spraying, with positive results, and reisolated. It is an actively motile rod, staining with carbol thionin blue and Congo red relief, rod-shaped or oval, the former measuring 0·9 to 1·7 by 0·5 μ and the latter 0·9 by 0·5 μ. In pure culture on nutrient agar or steamed potato the dimensions of the individual cells may be increased to 1·7 to 2 by 0·6 μ, and those of the double structures formed by the adhesion of two daughter cells to 2·6 to 3·5 by 0·6 μ. On nutrient agar at 27° C. the mustard-yellow, flat, shining, imperfectly circular colonies attain a diameter of 5 mm. in a week. The organism possesses one long polar flagellum (Morton's light blue staining method), is Gram-negative, non-acid-fast, liquefies gelatine slowly, forms a little acid after three weeks in dextrose, sucrose, lactose, and maltose, rapidly digests starch, forms hydrogen sulphide and ammonia from peptone, but not indol, and reduces nitrates to nitrites. These characters approximate most nearly to those of the bacterial pathogen of begonias in Denmark incompletely described by Buchwald as *Bacterium begoniae* and it is therefore proposed to refer the English organism to this species for which the name *Pseudomonas begoniae* (Buchw.) Pape emend. Dows. is provisionally adopted; it appears to be distinct from *Bact. flavozonatum* and from *Phytomonas flava begoniae* [loc. cit.]. A bacterial culture isolated from leaf spots on *Begonia tuberosa* in Portugal and sent to the first-named author by Mme M. D'Oliveira was also found to correspond in all particulars with the English pathogen.

Appropriate control measures are recommended, based on scrupulous attention to hygiene and the sterilization of workers' hands, implements, and the soil for raising cuttings, which should be taken from plants isolated in a disinfected greenhouse. There is some evidence that infection may be water-borne, and the plants should therefore be watered from a mains supply rather than from tanks, which may easily be contaminated by refuse. Humidity should be strictly regulated, ample ventilation provided, and wounds (through which the bacteria are most likely to enter the plants) carefully avoided.

Chester (F. D.). **A bacteriosis of Dahlia, Erwinia cytolytica.**—*Phytopathology*, xxviii, 6, pp. 427–432, 1938.

A stem rot of dahlia, characterized by a blackening and softening of the stem, was observed in 1936 in the New York Botanical Garden and from the bacteria present in the decayed tissues the causal organism was isolated and successfully reproduced the disease on inoculation into healthy plants. It is considered to be new and is named *Erwinia cytolytica*. It is a short rod averaging 1·5 to 4 by 0·7 μ, actively motile by peritrichous flagella, forming circular, convex, watery, glistening, pale greyish, and translucent colonies, which average 2 mm. in diameter after two days at 25 to 30° C. It is aerobic and facultatively anaerobic, reduces nitrates to nitrites, does not form indol or hydrogen sulphide, hydrolyses starch, grows well in Fermi's solution but not at all in Cohn's, produces (in synthetic media containing mineral salts and

ammonium phosphate) acid without gas from dextrose, lactose, sucrose, raffinose, mannite, salicin, and isodulcite, but no acid from levulose, arabinose, xylose, glycerose, or inulin, slowly liquefies gelatine, grows at 37° C. but not at 8° to 10°, with an optimum at 28° to 30°, and at P_H 6·8 to 7·3, feebly at P_H 5·0, and not at all at P_H 4·4.

Hopkins (J. C. F.). **A note on a stem rot of Sweet Peas.**—*Rhod. agric. J.*, xxxv, 6, pp. 417–418, 1938.

Wilting and death of sweet peas [*Lathyrus odoratus*] after emergence from the soil commonly occur every year in Rhodesia. From such material *Fusarium solani* var. *martii* was isolated in 1938. Affected seedlings showed pale brown or cream coloured lesions on the stem at soil level; in severe cases the stems exhibited marked constrictions, whereas in milder cases the plants showed only a small depression on one side, and sometimes the cotyledons showed small pale spots or else shrivelling of the margin. The severe attack of the disease occurred following a sudden hot, dry spell, and was controlled by watering with Cheshunt compound, consisting of 2 oz. copper sulphate and 11 oz. of ammonium carbonate.

Mundkur (B. B.). **Urocystis sorosporioides, a new record for India.**—*Trans. Brit. mycol. Soc.*, xxi, 3–4, pp. 240–242, 1 pl., 1938.

The leaves and petioles of a species of *Delphinium* (either *D. denudatum* or *D. vestitum*) growing at Simla in July, 1935, showed swellings caused by the smut *Urocystis sorosporioides*. This is stated to be the first record of this fungus in India [cf. *R.A.M.*, xvi, p. 515]. Leaves of a species of *Delphinium* collected at Chakratha were also attacked by the same smut.

Simon (E.). **Die Orchideenwelke, ein gefährlicher Parasit der Warmhauspflanzen.** [Orchid wilt, a dangerous parasitic disease of hothouse plants.]—*Blumen- u. PflBau ver. Gartenwelt*, xlii, 22, pp. 254–256, 1 fig., 1938.

After a number of preliminary tests [details of which are given] the writer found that *Sclerotium rolfsii*, the agent of a virulent wilt of Orchidaceae [*R.A.M.*, xv, p. 99], e.g. *Pyrrheima loddigesii* and other hothouse plants in Germany, may be effectively combated by 15 minutes' immersion of the root clumps in 0·1 per cent. ceresan. The concentration of 0·25 per cent. recommended by K. Flachs destroyed the sclerotia of the fungus on various plants but at the same time caused extremely severe injury. The fungicide is powerless to reach the sclerotia in the interior of rhizomes, e.g. of *Polypodium*, so that careful selection of planting material is indicated. *S. rolfsii* thrives on fresh beech leaf mould. Scrupulous care in the sanitation of the orchid house must be exercised and a 10 per cent. copper sulphate solution should be applied to the walls and flooring, and also used for the immersion of pots and planting-baskets.

Maxwell (K. E.). **Report on experiments to control leaf spot on Irises.** Reprinted from *Flor. Rev.*, lxxx, 2072, pp. 24–25, 1 fig., 1937. [Received September, 1938.]

Substantial reductions of iris leaf spot (*Didymellina macrospora*)

[*R.A.M.*, xvii, p. 507] were obtained in Long Island, New York, in 1935 and 1936, by two to three applications of Bordeaux mixture (4–4–50) or flotation sulphur (4–50), with the addition of a wetter and spreader of potassium resin soap (2 parts of resin, 1 part potassium hydroxide, 3 parts water used at the rate of 3 teaspoonsful per gal.). Green kolodust (sulphur) was also moderately effective, but less so than an equivalent number of spray treatments. The Black Midget, Dejah, Duke of York, Germaine Perthius, Glee, and Her Majesty varieties and 15 others proved to be highly resistant to leaf spot, but a large number of varieties [which are listed] were all more or less susceptible.

Milbrath (J. A.). **Diseases of ornamental shrubs in Oregon.**—*Plant Dis. Reptr*, xxii, 11, pp. 210–211, 1938.

A severe outbreak of powdery mildew (*Sphaerotheca pannosa*) was recently observed in western Oregon on *Photinia serrulata* [*R.A.M.*, xvi, p. 538]. Abundant spores of the *Oidium* stage (*O. leucoconium*) were noted, but no perithecia. This appears to be the first record of the species on *Photinia* in the United States, though in a footnote it is pointed out that Yarwood [ibid., xvi, p. 839] reported a powdery mildew with conidiophores of the *Podosphaera leucotricha* type on *Photinia glabra* and *P. serrulata* from California in 1937.

Dickey (R. D.) & Reuther (W.). **Manganese sulfate as a corrective for a chlorosis of certain ornamental plants.**—*Bull. Fla agric. Exp. Sta.* 319, 18 pp., 9 figs., 1938.

A chlorosis of crape myrtle (*Lagerstroemia indica*), *Bougainvillea*, *Allamanda cathartica*, cattley guava (*Psidium cattleianum*), *Thunbergia grandiflora*, flame vine (*Bignonia venusta*), and *Agyneja impubes* is widespread on overlimed as well as acid sandy and calcareous soils in Florida. Chlorotic leaves of crape myrtle show yellowish green to pale yellow areas between the midrib and primary veins extending until most of the lamina is occupied, when deep reddish blotches [not reported on other plants], indefinite in outline and extent, appear in the chlorotic areas. Finally the leaves become light yellow, on which are suffused red to purple anthocyanin pigments. Diseased leaves recovered and completely greened up three weeks after the affected shoots were dipped in a 0·5 per cent. solution of a CP grade of manganese sulphate mixed with an equal amount of calcium caseinate spreader, and similarly good control varying only in time was obtained with all other above-named ornamentals. Spray treatment is therefore recommended, preferably in spring preceding a period of rapid growth, with a spray mixture containing 2 oz. 80 per cent. manganese sulphate, 2½ gals. water, 1 oz. hydrated lime, and possibly a spreader. Limited trials with soil treatment, made on crape myrtle only, indicated that applications of manganese sulphate (1 lb. or more per tree) effectively controlled the disorder, recovery being attained in 30 days in some instances. It is believed that soil treatment will eventually prove to be the most permanent and practical measure; it cannot yet, however, be recommended for general use pending more adequate field trials.

Nagatomo (I.). **Notes on two diseases of ornamental plants caused by Cercospora.**—*Forsch. PflKr., Kyoto*, iii, pp. 109–114, 4 figs., 1937. [Received August, 1938.]

English and Latin diagnoses are given of *Cercospora nandinae* n.sp. (originally described by the writer in Japanese in 'Studies in middle-school education: materials for education', III, p. 79, 1932), the agent of a smoky-grey, later reddish-brown or reddish-purple, confluent spotting of the leaves and petioles of *Nandina domestica*, prevalent in the south of Japan. *C. althaeina* was observed forming dark brown, later greyish-white spots on the leaf blades, petioles, and stems of *Althaea rosea* [*R.A.M.*, xvi, p. 492] near Maizuru, Kyoto Prefecture.

Pape (H.). **Der Filzrost der Päonie.** [Felt rust of the Peony.]—*Blumen- u. PflBau ver. Gartenwelt*, xlii, 23, pp. 269–270, 2 figs., 1938.

A semi-popular account is given of the so-called 'felt' rust of peonies (*Cronartium asclepiadeum*), emphasizing its genetic connexion with the aecidial stage (*Peridermium cornui*) on pines (*Pinus sylvestris*) [*R.A.M.*, iv, p. 376; xvii, p. 281]. The common name of the rust is explained by the dense, dark brown coating of teleutospores formed on the lower leaf surfaces. In order to prevent the transmission of the 'felt' rust from pines to peonies, the former should be thoroughly inspected in the spring and all diseased material excised and burnt, while the latter should be repeatedly sprayed throughout the growing season with a copper-containing preparation.

Ingelström (E.). **Några aktuella sjukdomar på prydnadsväxter.** [Some diseases at present affecting ornamental plants.]—*Växtskyddsnotiser Växtskyddsinst., Stockh., 1938*, 2, pp. 22–24, 1938.

Popular notes are given on the incidence and control of the following diseases of ornamentals investigated at the Swedish Plant Protection Institute during the winter of 1937–8: *Botrytis galanthina* on snowdrops (*Galanthus nivalis*) [*R.A.M.*, xv, p. 442], *Entyloma dahliae* on *Dahlia variabilis* [ibid., xvii, p. 655], a virus disease of *Iris filifolia imperator*, agreeing in all particulars with that reported from the United States and elsewhere under the name of 'yellow stripe' [cf. ibid., xvi, pp. 254, 728] and causing a reduction of 60 per cent. in the number of saleable plants; and *Armillaria mellea* on *Thuja occidentalis*.

For the control of *B. galanthina* the writer recommends soil disinfection with 1 in 20 formalin and 30 minutes' immersion of the bulbs in mercuric chloride 1 in 750 or formalin 1 in 120, preceded by one hour's soaking in water. Repeated applications of 1 per cent. Bordeaux mixture are stated to be effective against *E. dahliae*, while liming of the soil is also advisable. The following varieties are resistant: Fürstin Henkel von Donnersmark, Wolfgang von Goethe, Heideprinzess (cactus types), Herbstkönig, Kupfergold, Pinoe, Maria Stuart (hybrids), Fanal, F. C. Heineman, Lucifer, Owen Thomas (single), Dr. Hirschbrunn, Fashion, Goldhähnchen, and Ladybird (pompoms).

Jones (W.). **Downy mildew of the Rose in British Columbia.**—*Sci. Agric.*, xviii, 10, pp. 627–628, 1 pl., 1938.

In July, 1937, rose downy mildew (*Peronospora sparsa*) [*R.A.M.*,

xvii, p. 682] caused considerable damage to Portadown and Lord Lonsdale roses in a low-lying garden in West Vancouver, British Columbia, slight infection also occurring on the varieties Mrs. Gladys Peach, Mrs. H. Morse, Mrs. Laxton, Lal, Crimson Glory, Trigo, and Mrs. C. Lamplough. The disease was also observed slightly attacking roses growing outdoors in two other localities. The affected leaves showed pale- to purplish-red, irregular spots and areas on the lamina and frequently along the veins; reddish to purplish areas were present on the stems, and brown spots or areas on the petals. Most of the affected flowers were spoiled.

Davis (B. H.). **The Cercospora leaf spot of Rose caused by Mycosphaerella rosicola.**—*Mycologia*, xxx, 3, pp. 282–298, 7 figs., 1938.

This is a full description of the author's studies on the leaf spot of roses caused by *Cercospora rosicola*, the imperfect stage of *Mycosphaerella rosicola*, a preliminary account of which has already been noticed [*R.A.M.*, xvi, p. 462]. The disease only affects the leaves, on which circular, well-defined spots appear, up to 10 mm. in diameter. The centre is necrotic and surrounded by a narrow brown or raisin black border, with sometimes an outer purplish zone. No data are available on the losses caused by the disease, but attacked plants may be practically defoliated by the middle of August. The perfect stage of the fungus is named *M. rosicola* (Pass.) n. comb. [n.sp.] with the following diagnosis in English: perithecia amphigenous but usually hypophyllous, erumpent, black, borne singly but rather thickly, 65 to 105 μ in diameter; asci astipitate, clavate, with walls thickened towards the tips, 36 to 57 by 9 to 11 μ, usually 45 by 9 μ; aparaphysate; ascospores olivaceous, biseriate or sub-biseriate, unequally 2-celled with the smaller cell towards the apex of the ascus, slightly curved on one side and flattened on the other, rounded at the ends, 13 to 17 by 4 to 5·3 μ. From a comparative study of herbarium material the author concludes that only three species of *Cercospora* out of the ten described on roses are valid, viz. *C. rosae* (Fuck.) von Höhn. (syn. *Exosporium rosae*, *C. hypophylla*, *C. rosae-alpinae*); *C. rosicola* (syn. *C. rosigena*, *C. rosicola* var. *undosa*, *C. rosae* van Hook, *C. rosae-indianensis*); and *C. hyalina* [ibid., xv, p. 59]. Revised descriptions of the first two species are given, together with a diagnosis in English of *C. puderii* n.sp. [ibid., xvi, p. 463] found on rose leaves in Florida. This new species produces spots with minute white centres and reddish-brown margins, forms prominent brown stromata, 18 to 36 μ in diameter, bearing dense fascicles of olivaceous conidiophores, brownish at the base, not geniculate or slightly so, 13 to 24 by 2·6 to 4 μ, with obclavate conidia with a heeled base, pale olivaceous, 1- to 7-septate, straight or curved, 30 to 75 by 2·0 to 3·5 μ.

Voorhees (R. K.). **Eye-spot disease of Napier Grass.**—*Phytopathology*, xxviii, 6, pp. 438–443, 3 figs., 1938.

The author describes the symptoms of an eye-spot disease of Napier grass (*Pennisetum purpureum*), first observed at Gainesville, Florida, in 1935, due to a fungus with morphological characters closely agreeing

with those of *Helminthosporium ocellum* [*R.A.M.*, xvii, p. 487], to which it is referred. The spots on the leaves are at first small, roughly oval, and reddish-brown; later on the centre becomes a lighter brown and finally the colour of dirty straw, while the margins become a deep red. The older spots vary in size from 1·5 to 3 mm. wide by 2 to 5 mm. long and usually remain oval or develop into elongated streaks. Heavily affected leaves wither and drop prematurely. On very susceptible strains of the grass, spots similar to those on the leaves, but brown rather than red, develop also on the leaf sheaths and stems. In inoculation experiments none of the plants immune from the disease in the field became infected in the greenhouse, but on field-selected susceptible plants small, water-soaked flecks were formed, sometimes 12 but mostly 24 hours after inoculation, and developed into spots closely resembling those observed in the field.

Petersen (Grace A.). **Perithecial material of Erysiphe and Microsphaera on Trifolium pratense.**—*Mycologia*, xxx, 3, pp. 299–301, 1 fig., 1938.

Apart from a collection by J. L. Sheldon of perithecial material of *Erysiphe polygoni* [*R.A.M.*, xvi, p. 104] on *Trifolium pratense* in 1908, in West Virginia, the perfect stage of this fungus is not known to have been found on red clover in the eastern United States though perithecia have been recorded from several of the western States. In the summer of 1937 the author collected at Ithaca, New York, the perfect stage of *E. polygoni* on *T. pratense* from two stations and perithecia of *Microsphaera alni* (Wallr.) Salmon from four other stations, though none of the leaves bore more than a few perithecia. *M. alni* has, to the author's knowledge, never before been reported on *Trifolium* either in America or elsewhere.

Hey (A.). **Versuche zur Sicherung des Serradellaanbaues und zur Abwehr der Stengelbrennerkrankheit (Anthraknose).** [Experiments to safeguard the Serradella crop and prevent the stem-burner disease (anthracnose).]—*Landw. Jb.*, lxxxvi, 1, pp. 1–21, 6 figs., 5 graphs, 1938.

This is an expanded account of the writer's studies (with M. Klinkowski and H. Richter) on anthracnose (*Colletotrichum trifolii*) of serradella (*Ornithopus sativus*) in Germany [*R.A.M.*, xvi, p. 540] and its control by appropriate cultural measures, notably late (June) sowing and crop rotation, supplemented in certain circumstances by seed disinfection with 0·125 per cent. germisan.

Richter (H.) & Klinkowski (M.). **Wirtelpilz-Welkekrankheit an Luzerne und Esparsette (Erreger: Verticillium albo-atrum Rke et Berth.).** [The whorl fungus wilt disease of Lucerne and Sainfoin (causal organism: *Verticillium albo-atrum* Rke & Berth.).]—*NachrBl. dtsch. PflSchDienst*, xviii, 7, pp. 57–58, 2 figs., 1938.

Two new hosts of *Verticillium albo-atrum* have been detected of recent years in Germany, namely, lucerne near Bonn and sainfoin (*Onobrychis sativa*) at Berlin-Dahlem. Transverse sections through

diseased lucerne roots revealed the typical circular, brown discolorations of the vessels, frequently extending to the adjacent sclerenchyma cell groups. Positive results were obtained in inoculation tests in which six-months-old lucerne plants were dipped in a loam emulsion permeated by the fungus and grown in pots in the greenhouse, the characteristic wilt symptoms beginning to develop after eight weeks and *V. albo-atrum* being reisolated from the discoloured vascular tissues.

In the case of *O. sativa* the fungus rapidly killed the plants, ruptured the dry, dead stems, and produced its well-known verticillate conidiophores on the surface.

Barbacka (Mme K.). **Obecny stan badań nad guzowatością korzeni (Bacterium tumefaciens Sm. et Town.) u drzew owocowych, jej szkodliwością i zwalczaniem.** [The present status of studies on the harmful effects of crown gall (*Bacterium tumefaciens* Sm. & Town.) on fruit trees, and its control.]—Reprinted from *Prace Wydz. Chor. Szkodn. Rosl. państw. Inst. Nauk. Gosp. wiejsk. Bydgoszczy*, 17, pp. 5–17, 1938. [English summary.]

The author reviews the present status of knowledge of the crown gall organism *Bacterium tumefaciens* [*R.A.M.*, xvii, p. 448, and above, p. 732] and states that her own researches have shown that the disease exerts a distinctly harmful effect on the growth of seedlings. No really satisfactory method of control has as yet been found, but in experiments carried out by her on young fruit trees [unspecified] planted in heavily infected land, a reduction of infection from 39·5 per cent. in the control to 33·9 per cent. was obtained by disinfecting the soil with calcium chloride (at a rate of 30 gm. per sq. m.) and a reduction from 49·3 per cent. infection in the control to 27·8 per cent. by steeping the roots before planting in a mixture of water, clay, and uspulun (0·5 per cent.). In Poland pears were found to be the most severely attacked of all fruit trees in the nurseries, and apples came second.

Hopkins (J. C. F.) & Bacon (Aline L.). **Common diseases of Apples and their control in Southern Rhodesia.**—*Rhod. agric. J.*, xxxv, 6, pp. 452–466, 2 pl., 1938.

A popular account is given of the diseases of apples occurring in Southern Rhodesia and their control by orchard sanitation and spraying. The diseases dealt with include, besides those mentioned in an earlier publication [*R.A.M.*, xvii, p. 45], die-back and canker (*Botryosphaeria ribis chromogena*) [ibid., xv, p, 238], sooty blotch (*Gloeodes pomigena*), die-back (*Phomopsis mali*) [ibid., xv, p. 33; xvii, p. 466], soft brown rot (*Alternaria* spp.), water-core [ibid., xv, p. 302], and measles [ibid., xvii, p. 608].

Bongini (V[irginia]). **Nebbia del Ciliegio.** [Cherry leaf scorch.]—*Boll. Lab. sper. R. Oss. Fitopat. Torino*, xv, 1–2, pp. 20–29, 2 pl., 1938.

After stating that cherry leaf scorch (*Gnomonia erythrostoma*) [*R.A.M.*, x, p. 802], formerly seldom found in Italy, occurred in epidemic form in 1937 in Piedmont, following a rather limited outbreak in 1936, the author gives a full account of the disease in semi-popular terms, based largely on the literature of the subject.

Willbirger (H.). **Erfahrungen in der Schorfbekämpfung beim Kernobst mit der 'Blauspritzung' und der Spritzmischung Kupfer+Schwefel am Bodensee.** [Experimental observations on scab control in pome fruits with 'blue spray' and the spray mixture copper+sulphur on the Lake of Constance.]—*Obst- u. Gemüseb.*, lxxxiv, 4, pp. 54–56, 3 figs., 1938.

In experiments against apple scab (*Fusicladium*) [*Venturia inaequalis*] in 1936 and 1937 in a district of Württemberg (Germany) bordering on the Lake of Constance, the application of a 'blue' spray (3 per cent. Bordeaux mixture) [*R.A.M.*, xvii, p. 375] just as the buds were beginning to open gave very satisfactory results and obviated the necessity of a further pre-blossom treatment. Great care should be exercised in the use of combined lime-sulphur and copper sprays, the maximum concentration permissible for the former being 2 per cent. (1 per cent. in dry weather) and for the latter (cupromaag) 0·05 per cent. Even with these precautions injuries of various kinds are apt to result in the case of sensitive varieties, such as Boskoop, Ontario, and Teuringer Rambour.

Dunegan (J. C.). **The rust of stone fruits.**—*Phytopathology*, xxviii, 6, pp. 411–427, 2 figs., 1938.

An investigation into the marked variations noted in the prevalence and importance of the rust disease attacking primarily the leaves but sometimes also the fruit of *Prunus* spp., caused by the fungus *Tranzschelia* [*Puccinia*] *pruni-spinosae* [*R.A.M.*, xvi, p. 776] revealed that uredospores from cultivated hosts from various parts of the United States would infect peach leaves but not those of wild species of *Prunus*. Conversely, uredospores from various wild hosts would not infect the peach. Aecidiospores from species of *Anemone* would not infect the peach but would infect wild species of *Prunus*, whereas aecidiospores from a cultivated species of *Anemone* would infect peach leaves but not those of wild species. In an examination of 389 herbarium specimens the teleutospores produced on the leaves of cultivated species of *Prunus* were found to be of the same type practically throughout the world and to be morphologically different from those on the leaves of wild species. It is concluded that there exist two distinct forms of the rust fungus, and the name *T. pruni-spinosae typica* (*T. pruni-spinosae* forma *typica* Fischer) is proposed for the variety found on wild species with teleutospores not thickened at the top and uniformly coarsely verrucose over both cells and *T. pruni-spinosae discolor* (*T. pruni-spinosae* forma *discolor* Fischer) for the one found on the cultivated species with the wall of the apical cell frequently thickened at the top and coarsely verrucose and that of the basal cell sparsely if at all verrucose. Technical descriptions in English and the host range of the two new varieties are given.

Pittman (H. A. J.). **Leaf rust of stone fruits.**—*J. Dep. Agric. W. Aust.*, Ser. 2, xv, 2, pp. 191–193, 2 figs., 1938.

Leaf rust (*Puccinia pruni-spinosae*) [see preceding abstract] of stone fruits does not generally attain epidemic proportions in Western Australia until rather late in the autumn, though in 1937–8 it became very

prominent in the summer and early autumn. Its chief effect is to cause premature leaf drop which towards the end of the season may render the trees prematurely dormant. In commercial orchards, however, this does not usually occur sufficiently early to cause serious under-development of the buds. In very late peach varieties the fruits may become infected and develop small broken blisters, from which the spores are released. The Goldmine variety of nectarine is often seriously infected on the leaves and fruits, especially in the wetter parts of the state. Plums are less seriously affected than peaches, nectarines, and almonds.

For control it is recommended that the trees should be sprayed shortly before leaf fall with Bordeaux mixture (6–4–40) plus calcium caseinate ($\frac{1}{2}$ lb.). All prunings should be promptly burnt. In early spring, about a fortnight before dormancy ends, the green manure crop should be ploughed under, together with any fallen leaves from the fruit trees, and the parts of the ground that cannot be ploughed should be dug. Any subsequent working of the ground should be shallow, and should be delayed as long as possible. A second spray application should be made in the early pink-bud stage. If required, further sprayings should be given at the shuck-fall stage with liquid lime-sulphur (1 in 100) plus $\frac{1}{2}$ lb. calcium caseinate per 50 gals., or dry-mix sulphur-lime, and the latter again 10 days later, two weeks after this, and finally 3 to 4 weeks before ripening. Peaches, nectarines, almonds, and plums should always be grown in very sunny situations; water should be applied only in large quantities occasionally, and the humidity of the air should be kept as low as possible.

Tago (K.). **Studies on anthracnoses of Japanese Apricot (Prunus mume S. et Z.).**—*Forsch. PflKr., Kyoto*, iii, p. 177–208, 1 pl., 1937. [Japanese, with English summary. Received August, 1938.]

The writer describes and tabulates the results of his comparative studies on seven strains of *Gloeosporium* and *Colletotrichum* causing anthracnose of Japanese apricot (*Prunus mume*), and of fungi of the same group isolated from ripe apple, cherry, grape, plum, and *P. tomentosa* fruits. Two of the Japanese apricot strains were obtained from the green fruits, while the rest originated on the leaves, one in association with *Taphrina mume* Nishida. The Japanese apricot strains were classified as belonging to two species on the basis of their morphological differences. One species, unidentified, comprises one of the green fruit strains and one of those from the leaf and is characterized by fusiform conidia, 7 to 16 by 3 to 6 μ, is devoid of setae, and does not form perithecia in culture. The other, identified as the conidial stage of *Glomerella mume* (Hori) Hemmi is represented by four leaf strains and one strain from green fruit; it produced oblong-ellipsoid or cylindrical conidia, 8 to 19 by 4 to 8 μ, forming brown setae in the acervuli and also perithecia in culture.

In addition to the foregoing, a ripe Japanese apricot attacked by quite a different species of *Colletotrichum* was found in the Osâka market; the fungus is characterized by crescent-shaped or falcate conidia, 17 to 27 by 3 to 6 μ, and a profusion of setae. The production of perithecia was also observed on maize meal agar cultures of the apple, grape, and plum anthracnose pathogens.

All the strains under observation made the best growth at 28° C. on apricot and potato decoction and soy-bean agars, with a maximum at 36°, except in the case of the grape anthracnose fungus, which developed slightly at 40°.

In inoculation experiments on ripe apple and Japanese pear [*Pyrus japonica*] and green Japanese apricot fruits, the unidentified strain from Japanese apricot fruits was more actively pathogenic than *G. mume*, which is commonly found on the leaves. The conidia of the former species survived about 80 days in a humid condition at —10°, whereas those of *G. mume* lived for only 17 to 34. The percentage germination of dried conidia of *G. mume* at 100 per cent. relative humidity was 13·60 to 19·35, the corresponding figure for the unidentified species being 2·97 to 7·55; neither germinated at a relative humidity below 96 per cent. Under dry conditions the conidia of the latter remained viable at —10° for 319 days and those of *G. mume* for 260.

Hemmi (T.) & Niwa (S.). **On Polystictus hirsutus (Wulf.) Fr. causing wood-rot of Cherry trees.**—*Forsch. PflKr., Kyoto*, iii, pp. 336–341, 2 figs., 1937. [Japanese, with English summary. Received August, 1938.]

Specimens of cherry wood from Mt. Yoshino, Japan, rotted by *Polystictus hirsutus* [*R.A.M.*, xvi, p. 138] were abnormally soft, light, and uniformly white. The growth range of the fungus on apricot and potato decoction and soy bean agars was from 10° to 43° C., with an optimum at 34° to 35°. No development was observed at 3°, so that the agent of the wood rot of cherry trees evidently belongs to the high-temperature group of wood-destroying fungi of Humphrey and Siggers [ibid., xiii, p. 413].

Hahn (G. G.). **Blister rust susceptibility studies of naturally pollinated seedlings of the immune Viking Currant.**—*J. For.*, xxxvi, 8, pp. 737–747, 3 figs., 1938.

The writer has investigated the possibility whether susceptible seedlings originate from the variety Viking (immune from *Cronartium ribicola* [*R.A.M.*, xvi, p. 109]) growing in localities where it may perhaps interbreed with garden varieties or in localities remote from these where only self-fertilization or intercrossing between Viking bushes can take place. If susceptible seedlings arose, the growing of the Viking currant in blister rust control areas might result in the distribution of susceptible seedlings in increasing numbers within these areas. Out of 1,086 seedlings partly from Norwegian and partly from American seed taken from Viking bushes standing alone only 43 were susceptible, whilst from 749 seedlings from Norwegian and American seed taken from bushes standing near other varieties 24 proved susceptible, making a total of 67 susceptible plants (3·7 per cent.). Out of 24,908 leaves tested only 360 produced blister rust fruiting bodies. Necrotic flecks appeared on the young inoculated leaves of the immune seedlings, but neither uredo- nor teleutosori were found associated with the flecks, and the flecks did not appear on mature leaves. Generally the immune seedlings grew vigorously and produced irregularly shaped, trilobate leaves

similar to those typical for the hybrid Viking parent, which is believed to be a form of the artificially produced hybrid species, *Ribes pallidum* (*Ribes petraeum*× *R. rubrum*), having probably inherited the rust resistance from *R. rubrum*. The variety Viking is very probably closely related to, or even identical with, the Red Dutch, the only other rust-immune garden currant, as demonstrated by Tubeuf [ibid., xiii, p. 136]. Among the 45 susceptible seedlings, selected from the total of 67, of which individual records were kept, 35 plants (78 per cent.) were moderately or highly susceptible, and most of them, except for two vigorous plants, grew poorly or did not survive; the 10 remaining plants were highly resistant or almost completely immune and grew vigorously. The evidence indicates that Viking did not cross with susceptible plants in the area where the seed was gathered and the very small percentage of susceptibles obtained from the total population studied shows that only a very small percentage of Viking seedlings are heterozygous, the majority being homozygous, and rust resistance a dominant character in the parent. Furthermore, it seems that multiple factors are involved in the inheritance of resistance, accounting for the lack of uniformity in the susceptibility of the susceptible Viking seedlings.

KADOW (K. J.). **Strawberry diseases in Delaware.**—*Plant Dis. Reptr*, xxii, 10, pp. 184–186, 1938. [Mimeographed.]

Strawberry red stele disease (*Phytophthora* sp.) [*R.A.M.*, xvii, p. 401] is stated to have killed off three-quarters of the plants (Lupton and Blakemore varieties) growing on an area of nearly 2 acres in Farmington, Delaware, on land not known to have been planted to strawberries before, while in another farm in the same locality about one-half of the plants (of the same varieties) growing over an area of about 3 acres had to be ploughed under on account of the same disease, and the rest were badly affected. Two other farms in the vicinity lost about 50 and 10 per cent. of the crop, respectively, from the disease, the smaller figure representing incipient attack only. In 1937, at Bridgeville, Delaware, a grower lost 12 acres of strawberries from a disease thought to be red stele.

ROGER (L.). **Sur deux maladies des Bananiers à la Guadeloupe.** [On two Banana diseases in Guadeloupe.]—*Agron. colon.*, xxvii, 246, pp. 161–176, 1 fig., 1938.

Banana leaf spot (*Cercospora musae*) is stated to have been reported on several occasions since 1932 from Guadeloupe [*R.A.M.*, xvii, p. 191], where its prevalence appears to have increased with increase in the area planted to bananas. At present, it occurs chiefly in the north-west parts of the island, the main focus of infection being at Goyave, though some less important centres are found in the south. In Martinique the disease has been noted for a few years, but no spread occurred until the end of 1937 and the damage is much less serious.

In Guadeloupe the losses caused generally range from 25 to 50 per cent., depending on the amount and date of appearance of the spotting. In serious attacks, only two or three leaves may be unaffected in the crown. Occasionally, the stem withers, and may collapse, many tens

of hectares having been lost in this manner in December, 1937. The outbreaks have always occurred in flooded, low-lying areas, and in soils with a high water table. Even a short period of flooding weakens the plant and the suckers, and the December outbreak appears to have been brought about through simultaneous flooding and reduction in temperature. Plantations on poor quality soils also suffered severely, and the fact that the disease is less serious in Martinique may be due to the greater fertility and better quality of the soil there. The epidemic outbreak in December, 1937, was the end result of the rapid extension of banana cultivation since 1932, in many cases in unsuitable localities.

Wardlaw has suggested trying out the I.C. 2 hybrid [ibid., xvii, p. 611], but the author considers that this should only be resorted to with great circumspection. The true remedy appears to lie in the choice of the right sites and the use of improved cultural methods, including manuring, the selection of healthy cuttings, adequate spacing, proper drainage, the prompt destruction of infected leaves and, when necessary, whole plants, the establishment of a five-year rotation in badly infected areas, the avoidance of banana leaves for packing purposes, and spraying two to three weeks before the critical periods of infection (wet and cold seasons) with neutral Bordeaux mixture plus a sticker.

Moko disease (*Bacterium solanacearum*) appeared in Guadeloupe in 1936 [ibid., xvi, p. 393], following floods, and frequently occurs in association with *C. musae*, though it is present in some localities outside the area affected by *C. musae*. Infection is favoured by the same conditions that favour leaf spot; in high, dry situations attacks are rare, sporadic, and limited. The disease affects the various types of *Musa sinensis*, but, apparently, is not severe on the Congo variety, while Gros Michel and abaca [*M. textilis*] are resistant.

Parham (B. E. V.). **New Banana varieties for Fiji.**—*Agric. J. Fiji*, ix, 2, pp. 12–14, 6 figs., 1938.

Observations made in Fiji on the hybrid banana I.C. 2 developed at the Imperial College of Tropical Agriculture, Trinidad, and imported into Fiji with three other types from the same source in January 1936, showed that it has notable resistance to leaf spot (*Cercospora musae*) [see preceding abstract]. Its leaves, however, are commonly infected with rust (*Uromyces musae*) [ibid., xv, p. 165] and speckle (*Chloridium musae*) [ibid., xvi, p. 476], and it is definitely susceptible to bunchy top [ibid., xvi, p. 195], to which three of the original stools succumbed. Of the other forms imported from Trinidad 'Giant Chinese' is also susceptible to *Cercospora musae*, while Lacatan is susceptible both to this disease and bunchy top, one of three stools being completely destroyed by the latter disease.

Traub (H. T.) & Robinson (T. R.). **Improvement of subtropical fruits other than Citrus.**—*Yearb. Agric. U.S. Dep. Agric. Sep.* 1589, 77 pp. [separately numbered after p. 827], 17 figs., [1938].

In this paper (omitted from the 1937 Yearbook) [*R.A.M.*, xvii, p. 124] the authors give an exhaustive account of the work accomplished in the breeding of subtropical fruits other than citrus in the United States and other countries. Breeding against avocado scab (*Sphaceloma*

perseae) [ibid., xiv, p. 459] is stated to have been in progress in the United States for three seasons and it has been found that seedlings of the Collinson and Kellerman varieties show a relatively high percentage of resistance. In Mexico search is being made for pineapple varieties resistant to *Thielaviopsis* [*Ceratostomella*] *paradoxa*, the commonest decay organism in Mexican pineapples. Mango-breeding for disease resistance in the United States is chiefly concerned with breeding large numbers of seedlings from groves where there is the greatest likelihood of cross-pollination. These seedlings are tested for resistance to anthracnose [*Colletotrichum gloeosporioides*: ibid., xvii, p. 539], those showing resistance usually being under 1 per cent. of the total. Under Puerto Rican conditions the resistant Divine variety might well be used for crossing purposes. Apparently the irregular bearing habit of the mango in Florida is primarily due to anthracnose, though other factors may also be operative in some instances.

KONISHI (S.). **On Pestalozzia causing the fruit-rots of Loquats in the market.**—*Forsch. PflKr., Kyoto*, iii, pp. 137–146, 4 figs., 1937. [Japanese, with English summary. Received August 1938.]

Loquats (*Eriobotrya japonica*) in Kyoto markets are stated to be liable to serious damage by rots due to two distinct species of *Pestalozzia*, the symptoms of which, however, are quite indistinguishable. One appears to be identical with that described by Inouye (in an unpublished paper) as a hitherto unknown species of *Pestalozzia* on loquat leaves, characterized by fusiform, 4-septate, bi- or tri- (rarely uni-) ciliate, olivaceous conidia, 16·6 to 32·6 by 4·1 to 6·6 μ, while the other agrees with *P. funerea*, described by Hara as an agent of grey spot on the foliage of the same host. The fungi are able to pass from the leaves to the fruit in the orchard.

ROBERTSON (W. C.). **Fungicides and insecticides. Brands registered for 1938.**—*J. Dep. Agric. Vict.*, xxxvi, 6, pp. 289–300, 1938.

A list is given of approximately 400 brands of insecticides, fungicides, sheep dips, and weed-destroyers registered for 1938 at the Office of the Director of Agriculture in Victoria, under the Fungicides Act, 1935 [cf. *R.A.M.*, xvi, p. 624].

SHORROCK (R. W.). **Soil sterilization. A description of different methods.**—*J. Bd Greenkeep. Res.*, v, 18, pp. 201–210, 4 pl., 1938.

Full descriptions, illustrated by photographs and plans, are given of various soil sterilization plants used at different golf courses in England [cf. *R.A.M.*, xvii, p. 475].

GORTNER (R. A.). **Viruses—living or non-living?**—*Science*, N.S., lxxxvii, 2267, pp. 529–530, 1938.

Further arguments are presented in support of Rawlins and Takahashi's contention that the 'non-living' nature of viruses has yet to be proved [*R.A.M.*, xvi, p. 417; xvii, p. 545]. Stanley's isolation of crystalline structures [from the tobacco mosaic virus: ibid., xvii, p. 544] has been considered to disprove the possibility of 'life' in this group of organisms, but the writer visualizes the viruses as 'naked nuclei', i.e. living entities deprived of all nuclear functions except those necessary

for the formation of chromatin and cell reproduction and wholly dependent on their hosts for nutrition and the production of cytoplasm. This hypothesis would account for the 'autocatalytic' reproduction of virus 'proteins'. All the classical autocatalytic reactions known to the writer involve a tearing-down process (chain reaction) whereby energy is released, so that an entirely new type of chemical reaction must be postulated if the autocatalytic protein theory is to gain acceptance.

Dounin (M. S.) & Popova (Mme N. N.). Капельный метод анализа вирусов в растениеводстве. [The drop method of virus diagnosis in plant husbandry.]—48 pp., 1 col. pl., 15 figs. Госуд. Издат. колх.-совх. Литер. „Сельхозгиз". [State Publ. Off. Lit. collect. co-op. Farming 'Selkhozgiz'], Moscow, 1937. [Received June 1938.]

The authors have evolved the following serological method for the diagnosis of virus diseases [cf. *R.A.M.*, xvii, p. 630]. The serum obtained from rabbits injected with the juice of a healthy plant when mixed with the juice of a similar plant affected by a virus causes the precipitation of such antigens as are specific for healthy plants, leaving the antigens of the virus in the solution, which can easily be separated from the precipitate by centrifuging. The solution is then injected into a rabbit and the serum thus obtained is specific only for the particular virus used. When the presence of this virus needs to be determined in a plant, one drop of this serum is squeezed on to a glass slide and a drop of the juice of the plant, taken from either leaf or tuber, added to it. When the virus is present the precipitation can be seen clearly in the drop, which remains unchanged, however, when the virus is absent.

A serum can be prepared to react with a number of viruses. The presence of various viruses (including aucuba mosaic, rugose mosaic, leaf roll, virus X) was tested for in 30 potato plants of different varieties, two plants each of *Nicotiana glutinosa*, *Datura stramonium*, and tomato by both the biological and the new drop methods and the results obtained agreed in each case. For practical work on the farms the dry serum, which can be preserved for over two months, can be easily made ready for use at any time by adding a drop of water or of 0·85 per cent. salt solution.

Pasinetti (L.). **La Röntgendiagnostica applicata alla fitografia ed alla fitopatologia. Memoria I. La Röntgendiagnostica come sussidio della anatomia macroscopica normale e patologica.** [Diagnosis by means of Röntgen rays applied to phytography and phytopathology. Paper I. Diagnosis by means of Röntgen rays as an aid to normal and pathological macroscopic anatomy.]—*Riv. Pat. veg.*, xxviii, 5–6, pp. 155–191, 12 pl., 1938.

In this introductory account of his researches the author presents evidence showing that it is possible by the use of Röntgen rays to identify different families of trees from the different degrees of 'opacity' and 'absorbing power' shown by the wood, to deduce the degree of mineralization present in the tissues, and to observe the arrangement of the mineral materials. The rays revealed structural alterations in pear wood affected by pruning injury and in beech wood injured by lightning. They also showed the presence of cold storage

injury in oranges and of other physiological defects in fruits which were not visible externally [*R.A.M.*, xvii, p. 702]. Marked structural changes [which are described] were revealed in wood of *Pinus cembra* infected by a fungus, probably one of the Polyporaceae, in oak infected by *Rosellinia necatrix*, plum infected by *Fomes igniarius*, and peach infected with *Ascospora beijerinckii* [*Clasterosporium carpophilum*]. In this last instance the photographs obtained showed clearly the parasitic and toxic effect of the fungus; there was a notable reduction in accumulated material followed by histological weakness, the process resembling true demineralization. The reduced opacity of the diseased wood permitted the medullary zone to be seen. The extent of the infection could be seen in outwardly healthy wood and the method therefore may possibly be of use in selecting plants for vegetative propagation. The rays also showed dry cankers due to *Sporotrichum cactorum* in an *Echinocactus grusonii* plant, and revealed that the base of a *Malacocarpus mammulosus* plant was completely transparent owing to destruction of the tissues by a wet canker caused by *Bacterium cactivorum* [ibid., xiv, p. 765].

Pasinetti (L.) & Grancini (P.). **Ricerche sugli effetti delle 'radiazioni' su Eumiceti patogeni in funzione del coefficiente respiratorio. (Nota preliminare.)** [Researches on the effect of 'radiations' on the respiratory coefficient of pathogenic Eumycetes. (Preliminary note.)]—*Riv. Pat. veg.*, xxviii, 5–6, pp. 193–203, 1 fig., 1938.

Exposure of cultures of *Corticium rolfsii*, *Sclerotium delphinii*, and *Alternaria brassicae* grown on malt extract (25 c.c.) in Petri dishes to direct sunlight, ultra-violet rays, Röntgen rays, and radium demonstrated that the last two stimulated respiration as measured by the Haldane apparatus while sunlight and ultra-violet rays had no effect or depressed it. In general, the three organisms reacted similarly, though *S. delphinii* and *C. rolfsii* were highly susceptible to the gamma rays, while *A. brassicae* when exposed to sunlight showed marked retardation in the respiratory rate, and when exposed to the Röntgen rays and radium showed a slight increase in rate of sporulation. The biologic effect of the different radiations on all the fungi was found to be related to the quantity of energy administered and absorbed.

Köhler (E.). **Die Viruskrankheiten der Kartoffel.** [Virus diseases of the Potato.]—*Mitt. Landw., Berl.*, liii, 23, pp. 509–512, 5 figs., 1938.

This is a popular account of the symptoms of some well-known virus diseases affecting the potato crop in Germany, with directions for their control by stringent selection, establishment of seed plots in isolated sites, and especially by the extermination [by methods which are fully discussed] during the winter months of the peach aphid, *Myzus persicae*, the principal agent of transmission of these disorders.

Friedrich (H.). **Eine neue Farbreaktion zur Diagnose des Abbaugrades der Kartoffelknolle. Vorläufige Mitteilung.** [A new colour reaction for the diagnosis of the degree of degeneration of the Potato tuber. Preliminary note.]—*Phytopath. Z.*, xi, 2, pp. 202–206, 1938.

The author gives preliminary notes on a new colorimetric method of

determining the degree of degeneration of potato tubers, based on the well-known Biuret reaction for the measurement of nitrogen content. To 2 c.c. pressed juice of the tuber were added 2 c.c. N/1 potash lye and the whole well mixed with 4 c.c. of a 0·5 per cent. solution of copper sulphate in a test tube, which was then kept at room temperature for 20 hours; after this period the colour reactions did not change and the results could be recorded. The pressed juice of healthy tubers invariably exhibited a bright yellow liquid, sometimes with a dark, supernatant layer above, and accompanying this coloration a fine or dense yellow precipitate or uniform turbidity may appear. The juice of diseased tubers always gave a clear violet or light lilac-coloured liquid, in which sometimes colourless or slightly yellowish, jelly-like lumps were suspended. Further extensive testing is required before the method can be used for the practical diagnosis of diseased tubers, but it is probably fairly accurate since no obviously discrepant results have been obtained so far. No theoretical interpretation of the phenomenon can be given at present.

Kausche (G. A.). **Zur Frage der experimentellen Erzeugung einer Variante beim X-Mosaikvirus der Kartoffel.** [On the question of the experimental production of a variant of the X-mosaic virus of the Potato.]—*Naturwissenschaften*, xxvi, 23, pp. 381–382, 1938.

Purified preparations of the Cs 35 strain of potato mosaic virus X at the Biological Institute, Berlin-Dahlem [*R.A.M.*, xvii, p. 265] were found to contain a variant similar to that observed in 1937. The centrifuged sediment of the acid fraction (P_H 4) dissolved in a phosphate buffer at P_H 7·2 was active in successive dilutions of 1 in 2 down to 1 : 32,768. All steps of the concentrations at first contained the variant, some 5 per cent. of which, however, reverted to the parent strain a fortnight after the development of the primary symptoms. The residual liquid was active at P_H 4 in the same volume as the dissolved sediment down to 1 : 524,288, and here again every step of the dilution contained the variant Csx, which reverted, however, to the parent strain in a similar period to the extent of 95 per cent. Thus, the acid fractions of strain Cs 35, after ammonium sulphate precipitation, contain two variants. It is as yet uncertain whether the variant retaining its stability in the sediment originates through chemico-physical treatment as a polymerization homologue, or whether it develops from the interaction of two already existing homologous variants, one of which has undergone some injury or suffered a delay of reproductive velocity. The difference between the dilution limits of 1 : 32,768 for the sediment and 1 : 524,288 for the residual liquid, respectively, may point to the separation in the centrifuge of two variants, of which the former would have a higher molecular weight.

Pfankuch (E.) & Kausche (G. A.). **Zur Darstellung von hochgereinigtem Kartoffel-X-Virus.** [On the preparation of highly purified Potato X-virus.]—*Naturwissenschaften*, xxvi, 23, p. 382, 1938.

The isolation of the potato mosaic virus X [see preceding abstract] may be greatly simplified and accelerated, according to observations

at the Biological Institute, Berlin-Dahlem, by the immediate thorough elimination of the chlorophyll and lipoids. Instead of Bawden and Pirie's method of heating the expressed juice to 60° C. [*R.A.M.*, xvii, p. 619], which has been found to entail a substantial loss of virus, the authors make use of carbon dioxide precipitation at 0° or chloroform treatment; in either case the centrifuged solutions must be left to stand for 10 to 20 hours at a low temperature. A subsequent single half-saturation ammonium sulphate precipitation produces practically colourless, opalescent virus solutions, stated to be at least equally as pure as those secured by the English workers' technique and easier to purify still further by reason of the virtual absence of colour. A similar treatment of the expressed sap of healthy controls results in the production of absolutely clear, colourless solutions devoid of precipitable albumin.

An essentially identical method is also useful for the isolation of the tobacco mosaic virus. In both cases the nephelometric mode of determination is employed for the semi-quantitative control of the purification process. The preparations are characterized by means of their turbidity value, i.e., the extent of turbidity developing under given conditions per weight unit of protein.

STAPP (C.). **Die Schwarzbeinigkeit der Kartoffel.** [Potato blackleg.]—*Kranke Pflanze*, xv, 6, pp. 103–106, 1938.

A popular account is given of the symptoms and etiology of potato blackleg (*Bacterium phytophthorum*) [*Erwinia phytophthora*] in relation to environmental conditions in Germany [*R.A.M.*, xvi, p. 832]. Of the 38 varieties immune from wart [*Synchytrium endobioticum*] tested of recent years for their reaction to blackleg [ibid., xiv, p. 525], only Alte Daber, Flava, and Sickingen showed any pronounced degree of resistance, though a fair capacity to withstand infection was manifested by Beseler, Rote Tiefgelbe (formerly Berolina), Konsum, Herbstgelbe (formerly Herbstgold), and Hellena. Control measures should include the use of sound, uncut tubers only, relatively shallow planting on heavy soils to facilitate respiration, fairly late planting, thorough soil aeration, immediate destruction of diseased material, procurement of seed from a fresh source if blackleg occurs on the same variety two years running, storage in a dry, cool, well ventilated place, and repeated inspections of the tubers during the winter with a view to the prompt removal of infection foci.

LEHMANN (H.). **Ein weiterer Beitrag zum Problem der physiologischen Spezialisierung von Phytophthora infestans de Bary, dem Erreger der Kartoffelkrautfäule.** [A further contribution to the problem of physiological specialization of *Phytophthora infestans* de Bary, the causal agent of Potato blight.]—*Phytopath. Z.*, xi, 2, pp. 121–154, 12 figs., 1938.

In his study on *Phytophthora infestans* on potato [*R.A.M.*, xvi, p. 403] the author demonstrated the typical and constant differences in the pathogenicity of the eight biotypes of the fungus, isolated in the summer of 1936 at Müncheberg, on a test assortment of 50 hybrids between *Solanum demissum utile* and *S. tuberosum*. According to their reaction to the races [as indicated in a table] the test clones can be

classified into 17 groups. Race 1, which proved to be the most generally distributed race in German fields, was the least virulent and attacked only 2 out of 50 test clones, while the most virulent race 8 attacked 47 vigorously and the remaining 3 weakly. Measurements of the sporangia of the eight races did not yield any uniform results but showed that the well-known variability of form and size of the sporangia in species of *Phytophthora* is very marked in *P. infestans*; clearly defined morphological differences between the eight races could not be detected. In infection experiments with the eight races on 30 varieties of cultivated potatoes no specialization between races and varieties was observed apart from an apparently greater susceptibility of tubers to race 1. The leaf infections showed no measurable differences, but the tubers of early potatoes were generally more susceptible than those of the late varieties. The clones of the test assortment, on the other hand, showed a very precise specialization of certain races on the foliage and tubers of certain clones, but no correlation between disease resistance and early or late maturity appeared to exist in the test clones. The discovery of the particularly virulent races Nos. 5 to 8 is stated to have considerably reduced the number of resistant wild varieties which could have been used in breeding resistant varieties of potatoes, and the necessity is stressed of selecting material from still larger and more complete collections of wild forms.

Corky scab in Otway. Minister's successful measures at eradication.—*J. Dep. Agric. Vict.*, xxxvi, 6, pp. 301–302, 1938.

Rapid progress is being made in the eradication of potato corky scab [*Spongospora subterranea*] from those parts of Beech Forest, Victoria, where the disease was found in June, 1936 [*R.A.M.*, xvi, p. 118]; on that date, infection was present on 28 farms and 222 acres, whereas on 23rd April, 1938, only 4 farms and 43 acres were affected. Arrangements were made in 1936 for growers whose crops were affected to sell their clean potatoes to Government institutions, where the peelings could be burnt. Small potatoes from the affected areas were not allowed to be sold for seed or used in clean districts. Growers were advised not to plant infected fields with potatoes for a time, and it was suggested that those areas should be sown down to pasture, the Department of Agriculture providing seed, manure, and advice.

Leach (J. G.), Krantz (F. A.), Decker (P.), & Mattson (H.). **The measurement and inheritance of scab resistance in selfed and hybrid progenies of Potatoes.**—*J. agric. Res.*, lvi, 11, pp. 843–853, 1 fig., 1938.

In testing the resistance to scab (*Actinomyces scabies*) [*R.A.M.*, xvii, pp. 413, 483] of 33 selfed lines and 27 crosses of potato in Minnesota, the authors on harvesting the crop gave each individual tuber a rating of 0, 1, 2, 3, or 4 (ranging from no lesions to large ones), and a scab rating for each hill was obtained by multiplying the number of tubers in each class by the number of the class and dividing the product by the total number of tubers in the hill. The scab rating for a seedling family was obtained by averaging the ratings of the individual hills. Four methods of classifying the material were used: (1) including ratings

of all tubers regardless of size, (2) including only ratings of the tubers larger than 1 in. diameter, (3) giving each hill a rating corresponding to the most susceptible type lesion found on any tuber of the hill, and (4) rating each hill into one of the five classes on the basis of the predominant type of scab lesion among all the tubers of the hill. The data obtained by these four methods of classification are presented and show that significant differences in scab susceptibility were revealed by all four methods but (1) was most effective, closely followed by (2). Method (3) gave significant differences between families whereas (4) proved unsatisfactory. In further statistical analyses the four methods maintained their same relative position as regards effectiveness.

The hereditary nature of differences in scab resistance was shown by grouping together those hybrid families with a common parent and comparing the variance of scab ratings between and within the groups. Data from 37 hybrid families grouped in 12 groups showed significant differences between the groups and indicated the relative breeding value of the common parents, the variety Jubel and the selection 5–14–8–1 having a high breeding value. Eight F_1 families having 5–10–1 as a common parent showed significant differences in scab resistance indicating differences in the unrelated parents in their ability to transmit resistance. A comparison of ten selfed lines showed wider differences to exist between the selfed lines than between their hybrid progenies. Crosses between susceptible parents gave a significantly higher mean scab rating than crosses of susceptible with resistant parents; crosses between intermediates and of intermediate with resistant parents gave a significantly lower mean scab rating still, and crosses between resistant parents the lowest rating of all.

ABE (T.). **On the relation of susceptibility of different portions of the Rice-plant to the blast fungus Piricularia oryzae Br. et Cav.**—*Forsch. PflKr., Kyoto*, iii, pp. 115–136, 1 pl., 1937. [Japanese, with English summary. Received August, 1938.]

Both under natural and experimental conditions the maximum number of blast (*Piricularia oryzae*) spots on rice [*R.A.M.*, xvii, p. 622] seedlings occurred towards the centre of the medium-sized leaves. The height of mature plants, the length of the spikes and their pedicels, and the weight of the spikes showed a tendency to diminish in proportion to the severity of the disease. The spikelets were the organs most liable to infection in mature plants, followed by the haulm (first internode) and spike pedicel internode, and the maximum reduction in kernel yield resulted from the invasion of all parts of the spike pedicels and the second internode of the haulm by the fungus.

AOKI (K.). **Physiological studies on the conidial germination of Piricularia oryzae and Ophiobolus miyabeanus.**—*Forsch. PflKr., Kyoto*, iii, pp. 147–176, 1 diag., 8 graphs, 1937. [Japanese, with English summary. Received August, 1938.]

Conidial germination in the rice pathogens, *Piricularia oryzae* [see preceding abstract] and *Ophiobolus miyabeanus* [*R.A.M.*, xvii, pp. 343, 699], was shown by the writer's experiments to be suppressed in an atmosphere containing an insufficiency of oxygen, the check to development

occurring at or above 50 per cent. oxygen absorption from ordinary air in the case of *O. miyabeanus* and at 10 per cent. in that of *P. oryzae*. The latter germinated better at an atmospheric content of 5 to 30 per cent. carbon dioxide than in air deprived of the same percentage of oxygen. Although a proportion of the conidia of *O. miyabeanus* germinated in an oxygen-free atmosphere as well as in one containing 100 per cent. carbon dioxide, no growth was made by *P. oryzae* under comparable conditions. The presence in the atmosphere of 50 to 70 per cent. carbon dioxide induced structural abnormalities in the germ-tubes of both fungi. Excess of oxygen slightly inhibited conidial germination in both organisms. The development of conidia of *P. oryzae* was arrested by contact with those of *O. miyabeanus*, but the latter did not suffer from the proximity of the former.

The conidia of *O. miyabeanus* germinate through a wider range of hydrogen-ion concentrations than those of *P. oryzae*, which develops better at P_H 5 to 6 and 8 to 9 than in a medium adjusted to neutrality. Mycelial growth in the latter fungus is almost equally abundant at P_H 4·6 and 9·6, so that vegetative development and conidial germinability are evidently distinct phenomena. The hydrogen-ion concentration chiefly affects germ-tube length rather than the percentage of germination in both fungi.

In tests to determine the effect on *O. miyabeanus* and *P. oryzae* of variations in the osmotic pressure of the medium by the addition of glucose or glycerine, both organisms germinated almost equally well in solutions from 0·1 to 1·0 mol with a slight tendency to an increase in the germination percentage and germ-tube length with rising pressure. In a 2 mols solution (50 atmospheric pressures) there was a rapid decline in germination and at 3 mols the fungi made only scanty growth.

HEMMI (T.). **On cereal diseases in Japan.**—*Forsch. PflKr., Kyoto*, iii, pp. 1–17, 1937. [Received August, 1938.]

A tabulated list is given of some common cereal diseases in Japan, followed by a discussion of certain aspects of rice blast (*Piricularia oryzae*) [see preceding abstracts], stripe and dwarf [ibid., xvii, p. 552], and 'bakanae' disease (*Gibberella fujikuroi*) [ibid., xv, p. 173; xvii, p. 699]. Most of the information herein presented has already been noticed in this *Review* from other sources, but it is of interest to record the recent discovery by Kuribayashi (published in Japanese) that the widespread and destructive stripe disease of rice in the Nagano district of Japan is due to a virus transmissible in 12 to 46 days by the insect *Delphacodes steriatellus* (*J. Pl. Prot.*, xviii, 1931). The symptoms of the trouble, which affects both the paddy and upland types of rice, include torsion, abnormal elongation, and drooping of the young leaves, which are narrow and of a pale colour, with one or more yellowish-green or yellowish-white stripes running parallel with the midrib, and emptiness or absence of ears.

KIMURA (K.). **On the relation of fungi to discoloured Rice seeds.**—*Forsch. PflKr., Kyoto*, iii, pp. 209–233, 1 col. pl., 1 fig., 1937. [Japanese, with English summary. Received August, 1938.]

The following fungi were isolated from rice grains affected by various

types of discoloration in the neighbourhood of Kyoto, Japan: *Phoma glumarum* [*R.A.M.*, xiii, p. 652], *Ophiobolus miyabeanus*, *Alternaria oryzae* [ibid., xiv, p. 653], *Epicoccum hyalopes* Miyake, and *Gibberella saubinetii* [ibid., xvi, p. 384]. Similar effects were produced by the inoculation of rice grains with *P. glumarum*, *O. miyabeanus*, *A. oryzae*, *E. hyalopes*, *Brachysporium oryzae* [ibid., xiii, p. 653], *G. fujikuroi* [see preceding abstract], and *Fusarium* spp., before, during, and after the flowering period of the plants, the fungi being most virulent when introduced before flowering and least so after its completion. The highest degree of pathogenicity was manifested by *O. miyabeanus*, followed in descending order by *G. fujikuroi*, *F.* sp., *B. oryzae*, *P. glumarum*, *E. hyalopes*, and *A. oryzae*. Each of the ten types of discoloration recognized appeared to be caused by a certain fungus or by several fungi together.

Seto (F.). **Studies on the 'bakanae' disease of the Rice plant. V. On the mode of infection of Rice by Gibberella fujikuroi (Saw.) Wr. in the flowering period and its relation to the occurrence of the so-called 'bakanae' seedlings.**—*Forsch. PflKr., Kyoto*, iii, pp. 43–57, 2 diags., 1937. [Japanese, with English summary. Received August, 1938.]

During 1933–4 the writer continued his experimental studies in the Kyoto district of Japan on the mode of infection of rice by *Gibberella fujikuroi* [see preceding and next abstracts] during the flowering period [*R.A.M.*, xv, p. 173]. In inoculation tests by spraying conidial suspensions of the fungus on healthy rice heads, infection was found to take place not only during or immediately after flowering, but at any time within the ensuing three weeks. Over 74 per cent. of the kernels in the series of plants inoculated at flowering time during the two years of the trials contracted the 'bakanae' disease, whereas in those inoculated in the early stages of kernel development the percentage ranged only from 21 to 40 per cent. Inoculations of the rachis and branches were sometimes successful, the average percentage of branch infection at different times being 17·53. Rice seedlings are invaded in the early stages of growth by the 'bakanae' fungus, which becomes systemic within the plant but does not usually penetrate the floral parts. The culm surfaces of badly diseased plants frequently bear sporodochia, which are the principal source of inoculum for floral infection.

Imura (J.). **On the alcoholic fermentation of Gibberella fujikuroi, the causal fungus of the 'bakanae' disease of the Rice plant and its relation to pathogenicity.**—*Forsch. PflKr., Kyoto*, iii, pp. 289–309, 1937. [Japanese, with English summary. Received August, 1938.]

Fermentative activity, determined by the volume of carbon dioxide produced by the mycelia of 14 strains of *Gibberella fujikuroi*, the agent of 'bakanae' disease of rice [see preceding abstracts], on a peptone-salt solution plus 5 per cent. glucose, was found to vary among the different strains, the intensity of anaerobic respiration in the strongest during a 15-day period being three times as great as in the weakest. No definite correlation could be detected between fermentative activity and pathogenicity to rice seedlings, but there was a tendency for the strains with

weak fermentative activity and strong pathogenicity to grow more vigorously under aerobic conditions than those with a pronounced capacity for fermentation.

MURRAY (R. K. S.). **Report of Botanist and Mycologist for 1937.**—*Rep. Rubb. Res. Bd, Ceylon, 1937*, pp. 22–33, 1938.

During 1937, owing to late wintering in the low-lying districts, infection of *Hevea* rubber in Ceylon by *Oidium* leaf disease [*O. heveae*: *R.A.M.*, xvi, p. 709] was mild, though in areas where sulphur dusting was not carried out the latest-wintering trees became severely defoliated. At high elevations the disease was as prevalent as in previous years.

Numerous outbreaks of root disease, usually associated with *Fomes lignosus* or *Poria hypobrunnea* [ibid., xvii, p. 624], occurred in replanted clearings. In every case investigated the source of infection by *F. lignosus* was traced to an old rubber root, demonstrating that the fungus was present before the old trees were removed, but was not doing enough damage to give any visible indication of its presence above ground. When an infected tree is felled and the roots are left in the ground, the balance between fungus and host is disturbed, and the former begins to grow actively. *P. hypobrunnea* is extremely rare as a cause of root disease in old rubber, and its prevalence in new clearings suggests that young plants are much more susceptible to infection than mature trees.

VERGOVSKY (V. I.) & VODOLAGHIN (V. D.). Вредители и болезни эфирномасличных растений и борьба с ними. [Pests and diseases of essential oil plants and their control.]—116 pp., 86 figs., Всесоюзн. научно-исслед. Инст. эфирномасл. пром. ,,ВИЭМП''. [Pan-Soviet sci. Res. Inst. essent. Oil Ind. 'VIEMP'], 1938.

This is a practical handbook dealing with the symptoms and the control of pests and diseases of essential oil plants occurring in U.S.S.R. The chief disease of coriander [*Coriandrum sativum*] and anise [*Pimpinella anisum*] is a blackening and deformation of the fruit, resulting in a decrease of the yield. The etiology of the disease is obscure. Affected coriander seeds lose their germinability almost completely, while the germinability of anise is decreased by 30 to 50 per cent. The disease occurs in all districts where the plants are grown, the percentage of infected seed in the Voronezh district usually varying between 1 and 20 per cent., but rising in some years (e.g., 1937) to 50 per cent. or more. Witches' broom usually affects up to 3 per cent. of coriander and anise plants grown in the Voronezh district, the diseased plants forming no fruit. *Erysiphe umbelliferarum* occurs on anise in all districts but develops only to a very slight extent in dry years. For the general control of diseases of coriander and anise it is recommended to use clean seed, to sow the new crop as far as possible from land cropped in the previous year, to sow early, to remove and to destroy plant debris and straw, and to apply hot-water treatment to the seeds (pre-soaking for 8 to 12 or even only 3 hours and steeping in hot water at 50° C. for 15 to 20 minutes).

The root rot of thyme [*Thymus vulgaris*] due to *Fusarium* sp. usually forms several centres of infection in the field causing the bare patches. Disinfection of the patches is advised, together with a peripheral zone

at least 0·5 to 1 m. wide, with bleaching powder applied at a rate of 100 to 200 gm. per sq. m.

The chief disease of fennel [*Foeniculum vulgare*] is caused by *Cercospora depressa*, which attacks the leaves, stems, and seeds, causing the seed to shrink and fall. In some years the seed losses in the forest-steppe belt of the Ukraine amount to 50 per cent. or more, and the oil yield of infected seeds is reduced by 15 per cent. *C. depressa* develops in the early summer and both infection and fructification occur only in presence of dew. In the autumn the conidia of *C. depressa* cease to form, but pycnidia of *Phoma anethi* are then found to be present. The *Cercospora* disease develops in the following spring from infected seeds and plant debris and is also spread from *Anethum graveolens*. *Alternaria tenuis* forms a black mould on the surface of the fennel seeds. Hot-water treatment of the seeds is recommended in the control of fennel diseases (pre-soaking for 15 to 18 hours at 17 to 20° and steeping in hot water at 53° for 10 minutes).

Peppermint [*Mentha piperita*] rust (*Puccinia menthae*) [*R.A.M.*, xvi, p. 87; xvii, p. 6] causes an annual loss of about 25 per cent. of the leaves or even 50 per cent. and more in wet years, decreases the oil yield by 16 to 23 per cent., and lowers the quality of the oil by reducing the menthol content. Peppermint No. 541 is the most resistant to rust and contains up to 5 per cent. oil with a high menthol content. The 'white ryaboukha' disease of peppermint, the origin of which remains unknown, has considerably increased during the last few years. It appears in May or June in form of dark, small spots on the leaves, stalks, and stems of the plants and leads to premature leaf fall and to a general debility of the plant. The powdery mildew of peppermint (*Erysiphe cichoracearum* f. *menthae* Jacz.) occurs in all districts, but in the Ukraine usually in a very mild form. In the control of peppermint diseases the use of clean planting material is recommended together with spraying with 1 per cent. Bordeaux mixture soon after emergence and three times more at intervals of 15 days.

Rose rust (*Phragmidium subcorticium*) [*P. mucronatum*: ibid., xvii, p. 459] attacks *Rosa damascena* and *R. alba*, but not *R. gallica*. *Sphaerotheca pannosa* var. *rosae* [loc. cit.] attacks ornamental roses, *R. canina*, and *R. gallica*, but affects *R. damascena* only slightly. During the last three or four years a stem wilt of roses (caused by a species of *Fusarium*) resulting in the ultimate death of the plants has considerably increased in the Crimea. *R. gallica* was most severely infected, especially on plots where vegetables such as potatoes or tomatoes had been previously grown.

Geranium [? *Pelargonium*] cuttings in hot-beds are affected by species of *Botrytis* [ibid., xvi, p. 43], *Graphium*, and *Dendrodochium*, by leaf spots caused by species of *Macrosporium* [cf. ibid., xvi, p. 537], *Ramularia*, *Didymaria*, *Botryosporium*, and *Haplographium*, and by leaf bacteriosis. In the field the geranium plant is attacked by black root rot due apparently to bacteria, and by brown root rot (*Hypholoma velutinum*), characterized by rapid withering of the plants and chiefly occurring on fields newly cleared from forest trees. For the control of geranium diseases the following measures are recommended: crop rotation, removal of tree debris in newly cleared fields, disinfection of cuttings prior to planting in the hot-beds in a 0·1 per cent. solution of

potassium permanganate for 2 to 3 seconds, and disinfection of the soil of hot-beds with a 1 per cent. solution of iron sulphate applied at a rate of 5 l. per sq. m. 10 to 15 days prior to planting.

A destructive disease of sage [*Salvia officinalis*], apparently of bacterial origin, causing hollowness of roots, occurs in the Krasnodar region and the Crimea. It is recommended that sage be planted as far away as possible from old sage fields, as it was observed that over 50 per cent. of the plants were destroyed in plots situated next to old sage plots. The same precaution should be taken for the control of leaf spot diseases of sage caused by *Ovularia ovata* and *Septoria salviae* var. *sclarea*. Other diseases of sage are caused by *Peronospora swinglei* and *Erysiphe labiatarum* Chev. f. *salviae* Jacz.

Septoria lavandulae [ibid., xvii, p. 71] is widespread on lavender in the Caucasus and in the Crimea but so far has not caused commercially appreciable losses, as severe attacks only occur very rarely. *Phoma lavandulae* [ibid., xi, p. 375] occurs on lavender in the Crimea and a wilt disease of undetermined origin [cf. ibid., xiii, p. 98] in the Caucasus, the Krasnodar region, and in a particularly severe form on the south coast of the Crimea.

Bureau of Sugar Experiment Stations. Fiji disease in the Bundaberg district.—Fiji disease in the Isis district. P.O.J. 2878 in the Mackay areas.—*Aust. Sug. J.*, xxx, 3, pp. 162–163, 1938.

Attention is once more urgently directed to the need for the immediate notification of fresh cases of Fiji disease in the sugar-cane plantations of the Bundaberg and Isis districts of Queensland [*R.A.M.*, xvii, p. 627], and for the prompt eradication of infected stools.

The recent decision of the Bureau of Sugar Experiment Stations to disapprove the further planting of P.O.J. 2878 in certain parts of the Mackay areas on account of its susceptibility to downy mildew [*Sclerospora sacchari*: loc. cit.] having evoked strong criticism among growers, a statement by the Director, Dr. Kerr, to the *Mackay Mercury* defending this action is reproduced. The resolution of the authorities was based on expert knowledge of the danger to the industry involved in allowing an apparently minor disease to proceed unchecked on a susceptible variety, and had been taken in the best interests of the growers. Suitable substitutes for P.O.J. 2878 in the affected areas are 2714, 2725, and Co. 290, while a new variety bred at the Mackay station, Q. 20, also merits further trials.

Clinton (G. P.) & Zundel (G. L.). **Notes on some Ustilaginales from India.**—*Mycologia*, xxx, 3, pp. 280–281, 1938.

This list of 11 species of smuts collected in India by R. R. and I. D. Stewart and identified by the senior author in 1926–7 includes *Urocystis magica* Pass. on *Allium rubellum*.

Petch (T.). **British Hypocreales.**—*Trans. Brit. mycol. Soc.*, xxi, 3–4, pp. 243–305, 39 figs., 1938.

This is a complete, descriptive monograph [with Latin diagnoses in the case of two new species] of British Hypocreales, with a key to the genera and an index to the species. It contains 124 species distributed

in 41 genera, grouped in the two families Nectriaceae and Hypocreaceae, and is the first complete account of these fungi published since Cooke's 'Handbook of British Fungi' appeared in 1871, in which 56 species were enumerated.

Nannizzi (A.). **Contributo alla flora micologica della Bulgaria : Micromiceti del circondario di Kazanlik, Balcani centrali.** [A contribution to the mycological flora of Bulgaria: micromycetes of the district of Kazanlik, central Balkans.]—*Atti Accad. Fisiocr. Siena*, Sez. agr., v, pp. 33–41, 1938. [Abs. in *Riv. Pat. veg.*, xxviii, 5–6, p. 213, 1938.]

A list is given of 87 species of fungi, including saprophytes, found on wild and cultivated plants in the vicinity of Kazanlik, Bulgaria, including *Septoria moesiaca* n.sp., attacking the leaves of *Atropa belladonna*. In wet seasons, considerable damage is caused to roses by *Phragmidium subcorticium* [*P. mucronatum*; see above, p. 771]. The list also includes *Ramularia foeniculi*, described by Sibilia on cultivated fennel [*Foeniculum vulgare*] in Italy [*R.A.M.*, xii, p. 244].

Hilborn (M. T.) & Markin (Florence L.). **List of causes of fungous and bacterial plant diseases in Maine to 1936 inclusive.**—*Plant Dis. Reptr, Suppl.* 105, 60 pp., 1 map, 1938. [Mimeographed.]

This list of plant diseases recorded in Maine up to the end of 1936 comprises 730 pathogens and 371 hosts.

Rick (J.). **Resupinati riograndenses.** [Resupinate fungi of the Rio Grande.]—*Broteria*, vii, 2, pp. 71–77, 1938.

Latin diagnoses are given of 18 resupinate fungi collected by the author in the Rio Grande Valley, Brazil; all the species except one are new and two new genera, *Basidiodendron* and *Gloeoasterostroma*, are erected.

Gigante (R.). **Il mosaico del Tabacco.** [Tobacco mosaic.]—*Boll. Staz. Pat. veg. Roma*, N.S., xviii, 1, pp. 93–130, 1 pl., 15 figs., 1938.

In 1937, a number of tobacco plants in pots, which had been kept in a greenhouse in Italy completely isolated from insects, were placed (still in pots) in the open, and after one month two showed symptoms of a mosaic disease characterized by variegated, rugose, and ribbon-like or even filiform leaves. Intracellular bodies 3 to 12 μ in diameter were present in the epidermal and mesophyll cells and in the leaf hairs. Inoculations of healthy tobacco, tomato, chilli, and eggplant by rubbing the leaves with juice expressed from the infected leaves, and by allowing *Macrosiphum gei* [*M. solanifolii*] taken from the diseased tobacco plants to feed on them, gave positive results, and it is considered that under local conditions this insect is probably the vector. From the symptoms produced in the different plants and the histological effects on the tissues, the author concludes that the mosaic in question is ordinary tobacco mosaic, due to Johnson's tobacco virus 1. The paper concludes with recommendations for control based on improved cultural practices, the prevention of spread on implements, workers' hands, and the like, and the suppression of the insect vector.

Levykh (P. M.). Вредоносность черной корневой гнили Табака. [The injuriousness of black root rot of Tobacco.]—Всесоюзн. научноисслед. Инст. Табачн. Махорочн. Пром. им. А. И. Микояна (ВИТИМ). [*The A. I. Mikoyan pan-Soviet sci. Res. Inst. Tob. and Indian Tob. Ind.* (*VITIM*)], Krasnodar, *Publ.* 135, pp. 23–30, 1938. [English summary.]

In a series of studies from 1933 to 1935 the author evolved a method of calculating the coefficient of injuriousness of black root rot of tobacco, caused by *Thielaviopsis basicola* [see next abstract]. Six hundred tobacco plants [variety unspecified] were planted in plots naturally infected with *T. basicola*; at harvest the yield records were taken from each plant separately and then the plants were pulled up and the percentage of infection recorded. It was thus found that no decrease of yield resulted when 10 per cent. of roots were infected; whereas infection percentages of 15 to 35, 45 to 65, and 70 to 100 corresponded with decreases in yield of 15, 30, and 53·2 per cent., respectively. In another experiment the mean degree of infection was found to be 60·4 per cent. and the mean decrease of yield 49·4 per cent. Correlating these two figures the coefficient of injuriousness is calculated as the percentage decrease of yield corresponding to 1 per cent. of the mean infection and was found to be equal to 0·81 (i.e. 49·4/60·4). Estimation of the decrease in yield from the coefficient of injuriousness and the mean per cent. infection proved to be almost accurate for plots with a low degree of infection, whereas in highly infected plots the figures were higher by about 10 per cent. than the actual yield records. It is suggested as an explanation that above 70 per cent. infection the yield is not further decreased. At the same degree of infection the decrease of yield varies considerably with the variety of tobacco and slightly with the type of soil. The coefficient of injuriousness was found to be 0·82 for the variety Trebizond 1272, 0·65 for Trebizond 649, and 0·44 for Trebizond 1705.

Koch (L. W.) & Haslam (R. J.). **Varietal susceptibility of Tobacco to brown root-rot in Canada.**—*Sci. Agric.*, xviii, 10, pp. 561–567, 2 pl., 1 diag., 1938.

During 1936, in a plot in Ontario originally designed to compare the morphological characters of 16 flue-cured tobacco varieties, brown root rot [*R.A.M.*, xvii, p. 560] developed soon after transplanting, and consistent differences in varietal reaction to the disease were noted. In 1937 further tests of the varietal susceptibility of both flue-cured and Burley varieties were carried out. It was found that on selected areas of the lighter tobacco soils the disease could be expected to develop with reasonable certainty, provided one or more maize crops preceded the tobacco, and it was on such plots the trials were made. Both the circumstances in which the disease develops in Ontario and its symptoms strongly indicate that it is similar to the disease in Connecticut [ibid., xvi, p. 67].

The results obtained [which are tabulated and discussed] showed extreme susceptibility in the flue-cured varieties Yellow Mammoth and White Stem Willow Leaf, and much resistance in White Mammoth,

Bonanza, White Stem Orinoco, and Duquesne, while certain other varieties were not entirely consistent in their reaction. Among the Burley varieties Harrow Velvet, Gay's Yellow, and Halley's Special were highly susceptible, and Judy's Pride and Kelley markedly resistant. Harrow Velvet, it is pointed out, is conspicuously resistant to black root rot [*Thielaviopsis basicola*: ibid., xvii, p. 560], while Judy's Pride and Kelley are extremely susceptible to it. These results, though only preliminary, are considered to indicate a promising means of control of the disease.

PARK (M.) & FERNANDO (M.). **Some studies on Tobacco diseases in Ceylon. III. The effect of the time of spraying and of the nature of the fungicide on the control of frog-eye (Cercospora nicotianae E. & E.). IV. The economics of field spraying for the control of frog-eye (Cercospora nicotianae E. & E.).**—*Trop. Agriculturist*, xc, 6, pp. 323–340, 3 figs.; pp. 341–347, 2 figs., 1938.

In further experiments on the frog eye disease of tobacco caused by *Cercospora nicotianae* [*R.A.M.*, xvi, p. 713] plots of Harrison's Special tobacco at the Ganewatta Experiment Station were sprayed with various fungicides at four different dates, viz., January 13th, 20th, 27th, and February 3rd, 1938. The plants were primed two weeks before the first spraying and topped for the first time on the day of the second spraying and subsequently at weekly intervals; the leaves were harvested from February 15th to February 22nd. A survey of yield records revealed that spraying on January 27th gave the best results, spraying on January 20th and February 3rd came second, and spraying on January 13th was the least effective. All of the fungicides used lessened the amount of infection in comparison with the unsprayed control; they ranged in the following order of efficiency: (*a*) proprietary colloidal copper 4 oz., proprietary spreader $\frac{1}{4}$ oz., water 4 gals.; (*b*) copper sulphate $2\frac{1}{2}$ oz., soft soap 13 oz., 66 per cent. ammonia 1 oz., water 4 gals.; (*c*) copper sulphate $2\frac{1}{2}$ oz., soft soap 16 oz., water 4 gals.; (*d*) proprietary colloidal copper 2 oz., proprietary spreader $\frac{1}{4}$ oz., water 4 gals.; (*e*) proprietary colloidal copper 1 oz., proprietary spreader $\frac{1}{4}$ oz., water 4 gals. The increases in yield over the unsprayed control were 230, 208, 190, 161, and 136 lb. cured leaf per acre, respectively. Since the fungicide (*a*) has the same copper content as (*b*) and (*c*), the better results obtained with it are ascribed to its wetting and adhesive properties and the degree of subdivision of its particles. In the light of the results obtained the optimum time for spraying appears to be determined by the rate of expansion of leaf surface and the drift of infection. Spraying during a period of rapid expansion is of little value and should be delayed until growth has diminished, the factor limiting this delay being the increase in the volume of infection. The incubation period of frog eye lesions being eleven days, it is assumed that most of the infections took place just after the spraying on January 27th, since the number of frog eye lesions was still very small on February 10th but very high on February 14th. The spraying of January 27th gave the best results, because at this date the leaves of the plants had expanded nearly to their maximum and the level of infection was at its minimum. The symptom picture curves indicate that two sprayings at intervals

of about a fortnight would give better control than a single spraying, while more than two sprayings are unlikely to give additional control.

The economic aspect of field spraying was investigated at the Wariyapola Experiment Station in 1938 on a field of Harrison's Special tobacco, about 16 gals. of spray (*a*) being used for about 300 plants. Assessing the cost of spray materials at Rs. 17·26 per acre, labour (7 men at 45 cents a day each) at Rs. 3·15 per acre, depreciation of the sprayer at Rs. 10 per acre, and adding charges for supervision and minor repairs, the cost of spraying is calculated as Rs. 35 per acre. The sprayed plants yielded 193·6 lb. grade I flue-cured tobacco per acre as compared with 54·4 lb. in the unsprayed control, the difference in value amounting thus to about Rs. 140 per acre. The substitution for the proprietary colloidal copper of two home-made copper sprays reduced the cost of spray materials to Rs. 8·71 and Rs. 7·44 per acre, but they were both less effective and caused a certain amount of spray injury.

WICKENS (G. M.). **Plant pathology.** *ex* **Report of the Tobacco Research Board for the year ending December 31st, 1937 (continued).**—*Rhod. agric. J.*, xxxv, 6, pp. 424–431, 1938.

In this report [*R.A.M.*, xvii, p. 708] the following leaf spot diseases of tobacco are stated to have occurred on the Station during the season under review. Frog eye [*Cercospora nicotianae*: see preceding abstract] was generally prevalent and was not appreciably controlled by spraying or dusting, the spread of infection being much more simply and cheaply checked by priming off and destroying the small first leaves, which are commercially valueless, before they develop frog eye spots, and by reaping the following leaves at a stage of maturity, at which they are sufficiently advanced to be cured but show only negligible frog eye infestation and come out of the barn relatively clean. Although the more frequent reaping involves more labour and more barn accommodation, the increased cost is considered to be many times outweighed by the enhanced value of the crop. *Alternaria* leaf spot [*A. longipes*: ibid., xii, p. 748; xvii, p. 490] occurred generally but caused only slight infection. Two very small outbreaks of angular spot [*Bacterium angulatum*: ibid., xvi, p. 2] occurred early in January, but the disease did not spread after affected leaves were removed. Spraying with Bordeaux mixture or dusting is recommended for the control of both the *Alternaria* and angular leaf spots, especially in districts where the soil is heavy and these diseases may assume a serious epidemic form; in addition a regular routine of spraying or dusting of the seed-beds is advised. In spite of thorough application of the usual precautionary measures against mosaic (frequent washing of the hands and separate pruning of diseased and healthy plants) and careful avoidance of all known sources of infection, the disease is stated to have occurred to a considerable degree, and it is concluded either that these measures are not sufficiently efficient or that there are some sources of infection and means of spread of the disease which these measures fail to control. It is, therefore, essential to know these sources before complete control measures can be worked out applicable under Rhodesian conditions.

SHARP (A.). **Experiments with Tobacco seed-bed covers at Manjimup (1937).**—*J. Dep. Agric. W. Aust.*, Ser. 2, xv, 2, pp. 248–251, 4 figs., 1938.

In further tests carried out in Western Australia in 1937 with various types of covers for use on tobacco seed-beds treated with benzol against downy mildew [*Peronospora tabacina*: *R.A.M.*, xvi, p. 284; xvii, p. 211] windowlite was the most satisfactory as regards seedling growth, closely followed by unbleached calico, washed to removed the dressing, and treated with raw or boiled linseed oil; growth under the control covers (unbleached calico treated with a mixture of paraffin wax, petroleum jelly, boiled linseed oil, and mineral turpentine) was definitely slower. The windowlite appeared to be as good as new at the end of the season, whereas the linseed-oil calico covers were unfit for further use. The control covers are expected to prove serviceable for one more season at least.

VAN DER MEER MOHR (J. C.). **Verslag van het Deli Proefstation over het jaar 1937.** [Report of the Deli Experiment Station for the year 1937.]—*Meded. Deli-Proefst.*, Ser. 2, c, 44 pp., 1938.

Much of the phytopathological work described in this report [cf. *R.A.M.*, xvii, p. 416] has already been noticed from another source [ibid., xvii, p. 632], but the following may be mentioned. The terms 'pseudo-mosaic' or 'false peh-sim' will in future be used to designate an obscure group of tobacco diseases having nothing in common with true mosaic but foliar mottling. Unlike true mosaic, pseudo-mosaic is not transmissible by direct contact, though it can be conveyed by grafting and possibly spread by means of insects. These disorders have definitely been on the increase in recent years.

A substantial reduction in the incidence of 'wet stalks' [ibid., xvi, p. 414] was secured by liberal applications of lime, which resulted, however, in an undesirable hardening of the plants; this was corrected by the admixture of tobacco ash with the lime.

WHITE (H. L.). **Further observations of the incidence of blotchy ripening of the Tomato.**—*Ann. appl. Biol.*, xxv, 3, pp. 544–557, 7 graphs, 1938.

The statistical study of the records over a number of years at the Cheshunt Experimental Station showed that the annual fluctuation in the percentage of tomato fruits affected with blotchy ripening [*R.A.M.*, xv, p. 539] on potassium-deficient and nitrogen-deficient plots showed a significant negative correlation with the mean daily number of hours of bright sunshine between 1st April and 31st August. On the potassium-deficient plots the weight of fruit produced was increased and the percentage of blotchy fruit reduced either by raising the potassium supply or by increasing the light factor. The beneficial effect of increased light on the crop of the potassium-deficient plants was much greater than any corresponding effect on the yield of the nitrogen-deficient or completely manured tomato plants. These results suggest that blotchy ripening is not due directly to lack of potassium or nitrogen but to metabolic disturbances that are counteracted by

increase in light. Since acceleration of blossoming and prolongation of ripening are associated with potassium deficiency, and also with low carbohydrate level, irrespective of the potassium supply, the beneficial effect of light on the fruit of potassium-deficient plants is attributable to increase in carbohydrate level. Furthermore, accumulation of carbohydrate in the leaves of potassium-deficient plants was indicated by the continued increase in the dry weight per unit area of the leaflets of such plants, from the youngest to the oldest. Increasing severity of potassium starvation was also associated with a progressive increase in the level of the dry weight per unit area. These data indicate that the translocation of carbohydrates is impaired in potassium-deficient plants. The juice of affected areas of blotchy fruit shows low amylolytic activity and the cell walls of the phloem may be extensively thickened; it is suggested, therefore, that the sugars are being condensed to cellulose in the blotchy fruits instead of participating in the normal ripening processes. The author concludes that blotchy ripening is symptomatic of deranged carbohydrate metabolism and may well be accompanied by derangement of the water relations.

Bouhelier (R.). **Quelques maladies dans les maraîchages.** [Some diseases in market gardens.]—*Fruits & Primeurs*, viii, 86, pp. 137–139; 87, pp. 173–174, 1938.

After stating that losses from fungal and insect diseases in market-gardens in Morocco may amount to 50 per cent. of the crop, the author gives a full account in popular terms of the symptoms of tomato early blight (*Alternaria solani*) [*R.A.M.*, xvi, p. 369; xvii, p. 96] and recommends the following measures of control. After harvest, all tomato plants and potato haulms must be burnt. At transplanting, every young plant showing the least trace of infection must be destroyed, and every bed showing too high an incidence of the disease must be eliminated. Transplants killed off by infection must be burnt. Affected fruits must be buried deeply, and the pit sprinkled with a strong disinfectant and covered with a thin layer of lime or a thick layer of earth. No tomato debris must be thrown on the dung-heap. Seed-beds must be disinfected with formalin and sowing should be carried out about 10 days later. The seedlings must be sprayed with cupric mixtures, and at transplanting the young plants should be dipped in a neutral cupric mixture, preferably Bordeaux mixture. Spray (or dust) applications must be made as soon as vegetation starts, and at frequent intervals.

Inoue (Y.). **Studies on the leaf-mould of Tomatoes.**—*Forsch. PflKr., Kyoto*, iii, pp. 310–335, 1937. [Japanese, with English summary. Received August, 1938.]

The writer's studies on tomato leaf mould in Japan showed that the causal organism, *Cladosporium fulvum*, penetrates the under side of the leaves through the stomata [*R.A.M.*, xvii, p. 634]; within a fortnight a grey or yellowish-brown mould develops over the invaded area, and in less than a month the infected leaf shrivels and drops. *C. fulvum* grew well on a synthetic agar medium containing peptone, potato decoction plus 2 per cent. saccharose, and soy-onion decoction or agar.

The most profuse development occurred at 20° to 24° C. [ibid., ix, pp. 70, 566], the maximum temperature for growth being ordinarily about 32° but decreasing in very acid media. The conidia germinate abundantly in 8 to 10 hours at the optimum temperature under very moist conditions (relative atmospheric humidity exceeding 92 per cent.). The optimum temperature for infection of the host appears almost to coincide with that for conidial germination. The course of the disease is influenced by the temperatures prevailing during the incubation period, a mean of 23° having been found most propitious under the conditions of the author's tests.

Brown (Nellie A.). **The tumor disease of Oak and Hickory trees.**—*Phytopathology*, xxviii, 6, pp. 401–411, 4 figs., 1938.

From galls on the trunk and branches of oak and hickory trees varying in size from less than ½ to over 12 in. in diameter and resembling crown gall in external appearance the author repeatedly failed to obtain *Bacterium tumefaciens* to which the galls have generally been attributed. No fungal fructifications have been observed on living galls, even when placed in a moist chamber, but isolations from overwintered galls yielded pycnidia of a *Phomopsis* [*R.A.M.*, xvi, p. 41] with *a* and *b* spores. Other cultures produced *Phoma*-like spores at first, and after chilling *Phomopsis* spores of both *a* and *b* types. Inoculations with the *Phomopsis* isolated from both oak and hickory produced galls on oak, hickory, *Viburnum opulus*, privet (*Ligustrum vulgare*), and *Jasminum nudiflorum*, and the fungus was successfully reisolated in each case; the strain from oak also produced galls on the cultivated blueberry (*Vaccinium corymbosum*). The parasite appears to be a weak one, entering the young tissues only through a wound and under moist conditions. No perfect stage of the fungus has as yet been obtained. The slow growth of the galls and spread of infection facilitate control of the disease by sanitation methods. Galls on maple (*Acer*) and elm trees have also yielded a fungus with *Phoma*-like spores, but so far inoculations have only resulted in some swellings and not galls. Isolations from the elm developed *Phomopsis* spores after chilling.

Bedwell (J. L.) & Fowler (M. E.). **Fungi found on Chestnut and Chinquapin in Oregon, Washington, and British Columbia.**—*Plant Dis. Reptr*, xxii, 11, pp. 208–210, 1938.

A list is given of 18 fungi so far found on species of *Castanea* and *Castanopsis* in Oregon, Washington, and British Columbia.

Goidànich (G.). **Nuove osservazioni sul 'disseccamento dei germogli' dei Pioppi.** [New observations on the 'withering of the shoots' of Poplars.]—Reprinted from *R.C. Accad. Lincei*, xxvii, 11, 3 pp., 1938.

After recapitulating the cultural differences between the Sphaeropsid G2191 and *Pollaccia radiosa* [*Venturia tremulae*: *R.A.M.*, xvii, p. 137] isolated from poplars in Italy affected with so-called 'spring defoliation', the author states that in 1936 shoot infection was almost entirely due to the former and only slightly to the latter, which was causing

severe leaf infection, but in 1937 and 1938 the Sphaeropsid was rare or only sporadic, while shoot infection by *P. radiosa*, hitherto regarded as a leaf parasite, was abundant.

It is now apparent that, whether the disease is due to the Sphaeropsid or to *P. radiosa*, the first severe attacks generally occur, in years when the spring is wet, from the middle of April to the beginning of May, after the first hot days. This happened in 1936 and 1937. In 1938, however, when the spring was exceptionally dry and cold, it was not until the last ten days of May, after the first spring rains, that a few infected shoots and leaves were found in Piedmont, Emilia, and Lombardy. The disease is not confined to the spring, but continues to develop, though to a less extent, throughout the summer, and into the autumn, the new foliage that appears after the first attacks repeatedly becoming infected.

Almost all the poplar plantations in the parts of the Po Valley nearest to the river are affected, and shoot infections were also found in Latium in 1937. Noteworthy progress is stated to have been made in the selection of resistant varieties.

SERVAZZI (O.). **Contributi alla patologia dei Pioppi. V. Segnalazione di tumori su Pioppo bianco.** [Contributions to the pathology of Poplars. V. Report of galls on White Poplar.]—*Boll. Lab. sper. R. Oss. Fitopat. Torino*, xv, 1–2, pp. 30–33, 1 pl., 1 fig., 1938. [French, German, and English summaries.]

During the spring of 1938, a row of about a dozen 10- to 12-year-old white poplars [*Populus alba*] in a road in Villafranca, Turin, showed the presence of galls up to 15 cm. in diameter, mostly on the branches, though a few were present near the tops of the trunks. Similar galls up to 5 cm. in diameter were also found on a few willows in the vicinity. The young galls were yellowish-red to red, round, scabrous, and somewhat cracked, and the old galls were more irregular, mammillate, hard, woody, greyish-brown or blackish, and much cracked on the surface. From these galls the author isolated several bacteria, including *Pseudomonas* [*Bacterium*] *tumefaciens* [*R.A.M.*, ix, p. 631], and an organism probably identical with *Bacillus populi* [ibid., x, p. 417], to which Brizi in 1907 attributed similar galls on *P. alba*, *P. tremula*, and *P. nigra*. Repeated needle-prick inoculations with this bacillus invariably gave negative results, from which the author concludes (in common with E. F. Smith) that *B. populi* is only saprophytic; he considers that Brizi's positive inoculations were probably made with cultures of *B. populi* contaminated with *Bact. tumefaciens*; in his opinion the tumours observed by him in Villafranca were produced only by *Bact. tumefaciens*.

WENT (JOHANNA C.). **Compilation of the investigations on the susceptibility of different Elms to Ceratostomella ulmi Buisman in the Netherlands.**—*Phytopath. Z.*, xi, 2, pp. 181–201, 2 figs., 1938.

This is a summarized account of the results obtained up to the end of 1937 from investigations started by Dr. Buisman in 1931, and since continued by the author, on the susceptibility of different varieties of elms to *Ceratostomella ulmi* [*R.A.M.*, xvii, pp. 213, 636]. Progress reports on the work have been regularly published in Dutch by the Committee

appointed for the study and control of the elm disease and have already been noticed in this *Review*.

REUTHER (W.) & DICKEY (R. D.). **A preliminary report on frenching of Tung trees.**—*Bull. Fla agric. Exp. Sta.* 318, 21 pp., 9 figs., 1937. [Received September, 1938.]

Bronzing of tung trees (*Aleurites fordii*) [*R.A.M.*, xiv, p. 481] has been successfully controlled during the past four years by the extensive use of zinc sulphate in Florida, but another disorder, possibly previously masked by bronzing and designated frenching, has been found to be rather widely distributed and severely affected a few areas in some of the commercial tung plantings in 1937, 5 to 10 per cent. of the trees in a total of 17 plantings surveyed (8,000 acres) showing symptoms in some degree. It is described as a partial chlorosis of the foliage, with necrotic spots in the chlorotic areas, and involving premature abscission of some of the leaves. When severely frenched shoots on two trees were tagged and dipped in a 1 per cent. solution of manganese sulphate to which 1 per cent. hydrated lime and about 1 per cent. calcium caseinate spreader were added, the leaves regained their normal colour within 30 days, and in similar experiments repeated in various localities frenched leaves responded to manganese treatment in some cases after three but more usually after four to six weeks. Immature leaves on rapidly growing shoots, which usually showed more severe symptoms than the hardened mature leaves, also responded more rapidly to manganese treatment, and the evidence indicates that frenching, and hence manganese utilization, is associated with rapid vegetative growth. Field trials with soil applications of manganese thus far conducted are yet too limited to allow of any definite recommendations for large-scale control, but it is suggested that growers having trees affected should make small experimental applications. An analysis of soil reaction showed that frenching was not confined to overlimed or highly calcareous soils but was negatively correlated with the exchangeable manganese content of the soil. Four out of five surface soil samples from areas free of frenching contained an average of about 3 lb. per acre of replaceable manganese whereas the samples from 10 areas affected with frenching contained an average of about 1 lb. per acre. In an additional experiment with a few trees of *A. montana* affected with frenching, a diseased tree made a striking recovery after two soil treatments with manganese sulphate (½ lb. and 5 lb.).

ROHMEDER (E.). **Versuch mit einem Schutzmittel gegen Buchenstocken.** [An experiment with a prophylactic against Beech rotting.]—*Forstwiss. Zbl.*, lx, 11, pp. 329–332, 1938.

Particulars are given of an experiment in the control of fungal rotting of felled beech logs at Grafrath, near Munich, by the application to the cut surfaces, branch insertion sites, decorticated ring (for measuring), and any cracks detected in the bark, of a proprietary preparation known as 'Marktredwitz' (Chem. Fabr. Marktredwitz). Five of the 15 trial logs (1 to 5) were treated immediately after felling on 6th May, 1936; on the same date another 5 (6 to 10) cut down ten weeks earlier (20th February) were similarly painted, while the remaining 5 (11 to

15), also felled on 20th February, were left untreated. All the logs were left lying in the open until April, 1937, when they were cut into planks and boards at the local sawmill. Nos. 1 to 5 showed very slight fungal infiltration to a depth of 10 to 30 cm. from the cut surface, whereas 6 to 10 and 11 to 15 were both penetrated by micro-organisms for distances of up to 2 m. Depreciation in the wood given immediate treatment was inconsiderable, whereas the economic value of the logs in the delayed applications and control series was greatly reduced; the proportions of the three lots fit for structural purposes were 92, 65, and 61 per cent., respectively.

HEMMI (T.) & AKAI (S.). **On Cyclomyces fuscus Kz. causing wood-rot of Shiia sieboldi Makino.**—*Forsch. PflKr., Kyoto*, iii, pp. 342–346, 1 pl., 1 fig., 1937. [Japanese, with English summary. Received August, 1938.]

Cyclomyces fuscus Kunze is stated to be prevalent throughout the south of Japan, causing a white pocket rot chiefly of the peripheral portion of the wood of *Shiia sieboldi* [syn. *Pasania sieboldi* (Fagaceae)]. The irregularly shaped and sized, predominantly elongated pockets are scattered in profusion through the affected wood. In the completely decayed areas the sound tissue between the pockets is so thin as to present a reticulate appearance. The hyaline, shortly ellipsoid or ovoid to pip-shaped spores, pointed at one end and sometimes slightly curved, measure 2·8 to 4 by 1·4 to 2 μ.

HEMMI (T.) & AKAI (S.). **Studies on the brown heart-rot of Shiia sieboldi Makino.**—*Forsch. PflKr., Kyoto*, iii, pp. 58–70, 3 pl., 3 figs., 1937. [Japanese, with English summary. Received August, 1938.]

Following on a typhoon of unprecedented severity in the Kinki district of Japan in September, 1934, many of the injured trees were found to be suffering from heart rot, which in the case of *Shiia sieboldi* and related species assumed the form of a deep brown, crumbly decay. The affected wood broke up into cubes owing to the formation of shrinkage cracks, which were frequently filled with thin but leathery mycelial mats. *Polyporus sulphureus* [*R.A.M.*, xvi, p. 716] was isolated from the diseased tissues, and in the following season two sporophores of the fungus were collected on the fallen trunks. On apricot, potato, and soy-onion decoction agars the minimum, optimum, and maximum temperatures for the growth of the organism were found to be 9° to 12°, 28° to 32°, and just above 36° C. Hyaline spherical to ovoid secondary spores, 6·6 to 13·3 by 6·6 to 10 μ, were formed singly in pure culture at the branch tips of the yellowish-brown, cottony or powdery mycelium.

HUNT (G. M.). **Preservative treatment of window sash and other millwork.**—10 pp., For. Prod. Lab., U.S. Dep. Agric., 1938. [Mimeographed.]

In this semi-popular bulletin, the author points out that heartwood is more resistant to decay than sapwood [*R.A.M.*, xvii, p. 151], which alone is susceptible to sap stain, and states that the use of durable woods (especially the heartwood) for the manufacture of window sashes and

frames provides a simple, if not the most practical or economical, method of avoiding decay. Paints and varnishes are not effective, and where the use of resistant wood is not possible, it is recommended that the finished wood parts be immersed directly before assembly for at least 3 minutes in any of the modern high-quality preservatives (generally consisting of an organic toxic chemical carried in a volatile solvent), longer and more thorough impregnation being, however, advisable for wood parts to be used in conditions favouring rapid decay and blue stain.

SCHMITZ (H.) & KAUFERT (F.). **Studies in wood decay. VIII. The effect of the addition of dextrose and dextrose and asparagine on the rate of decay of Norway Pine sapwood by Lenzites trabea and Lentinus lepideus.**—*Amer. J. Bot.*, xxv, 6, pp. 443–448, 2 figs., 1938.

Using the same methods as in earlier investigations [*R.A.M.*, xvi, p. 358] the authors conducted a series of experiments in which dextrose alone or with asparagin was added to air-dry Norway pine [*Pinus resinosa*] sapwood sawdust, inoculated with either *Lenzites trabea* or *Lentinus lepideus* [ibid., xvii, p. 4]. The data obtained showed that the addition of small or considerable quantities of dextrose significantly increased the average loss in total weight of sawdust and dextrose, caused by *Lenzites trabea* (from 36·5 per cent. in the control to 46·6 per cent. both with 0·3 gm. and with 4·8 gm. dextrose added), and decreased the average loss in total weight caused by *Lentinus lepideus* (from 20·3 per cent. in the control to 18·7 and 14·2 per cent. with 0·3 and 4·8 gm. dextrose added, respectively). When both dextrose and asparagin were added the rate of decay caused by *L. lepideus* generally decreased still further (7·3 per cent. loss in weight for the addition of 0·3 gm. dextrose and 0·9 gm. asparagin), while the rate of decay caused by *Lenzites trabea* was increased by the addition of small amounts of dextrose and asparagin, but was decreased by addition of larger amounts of the substances, especially of asparagin (the addition of 0·3 gm. dextrose plus 0·45 gm. asparagin and of 4·8 dextrose plus 0·90 gm. asparagin resulting in 47·3 per cent. and 27·5 per cent. loss in total weight, respectively, compared with 36·5 per cent. in the control). In further experiments, in which colonies of the two fungi were grown on agar prepared from Norway pine sapwood sawdust, it was seen that the addition of dextrose increased the radial growth of *Lenzites trabea*, except for the highest concentrations; the addition of both dextrose and asparagin did not greatly influence the radial growth of the fungus, but made the mycelial mat more copious and fluffy. In the case of *Lentinus lepideus* the radial growth was little influenced by the addition of dextrose in concentrations up to 2·64 per cent., but was retarded considerably by the addition of 5·28 per cent. of dextrose or of asparagin in 0·5 or 1·0 per cent. concentrations; the addition of asparagin also considerably changed the character of the mycelial mat. It appears from these data that in the presence of dextrose and asparagin *Lenzites trabea* manifests no selective feeding and destroys wood at the same or somewhat increased rates, while *Lentinus lepideus* utilizes the more available nutrients producing large quantities of mycelium, but does not attack wood as rapidly as in the absence of these nutrient substances.

HUNT (G. M.) & WIRKA (R. M.). **Tire-tube method of fence post treatment.**—10 pp., 3 pl., For. Prod. Lab., U.S. Dep. Agric., 1938. [Mimeographed.]

This is a very simple, economical, and reliable method of preserving freshly cut fence posts which have not been split. The bark is peeled for a distance of 4 to 6 in. from the larger end, and a piece of old inner tube 2 to 2½ ft. long is slipped over the peeled surface and bound in place. The post is laid on a rack so that the large end is about 1½ ft. or more higher than the small one, and the loose end of the rubber tube is fixed to a frame so that the requisite quantity of a 10 per cent. solution of zinc chloride can be poured into the tube. About 1 lb. zinc chloride should be absorbed per cubic foot of wood, the solution as it flows into the post forcing out the sap at the small end. With aspen posts 7 ft. long, the treatment generally takes 8 to 24 hours; it is expedited by warm weather. Outdoor treatment in freezing weather is not generally practicable, and posts treated indoors during frosts should first be allowed to thaw thoroughly. It is considered that posts treated by this method may be expected to last from 10 to 15 years.

[An account of this method appears in *Bett. Fruit*, xxxiii, 1, p. 7, 1938, and in *Agric. News Letter*, vi, 8 & 9, pp. 101–11, 3 figs., 1938.]

SCHMIDT (E. W.). **Ein neuer Weg zur Bekämpfung der Cercospora-Blattfleckenkrankheit der Zuckerrüben.** [A new way of controlling the *Cercospora* leaf spot disease of the Sugar Beet.]—*Angew. Bot.*, xx, 3, pp. 241–245, 1938.

The author's field observations in 1937, a year distinguished by abnormal climatic conditions and a resulting prevalence of the leaf spot disease of sugar beets (*Cercospora beticola*) [*R.A.M.*, xvii, p. 428], showed that in many cases rows of beets severely attacked by the disease grew next to entirely healthy rows. It was found that in the first case seed-clusters from the 1936 harvest had been used and in the second case those from the harvest of 1935. When the seed-clusters from 1936 and 1937 were examined in 1937, after careful and repeated washing, soaking in distilled water, followed by three days' incubation on damp filter paper at a temperature of 28° C., no spores of *C. beticola* were found, and therefore no viable mycelium is thought to have been present in the 1936 clusters (which were then 1¼ years old), while spores were developed in about 30 per cent. of the 1937 clusters. It is concluded, therefore, that the mycelium remains viable in the clusters for about one year and that consequently either disinfection of the clusters or the use of one-year-old clusters should constitute a good measure of control.

Service and regulatory announcements. January–March, 1938.—*S.R.A., B.E.P.Q.* 134, pp. 4–36, 1938.

Summaries are given of the plant quarantine import restrictions in force in St. Christopher (St. Kitts) and Nevis, Gold Coast, Papua (Australian Territory), Iraq, Italy, Japan, and the Union of South Africa. Supplementary notices of amended legislation are also given for Egypt, France, Bulgaria, the Argentine, Ceylon, Sweden, Morocco (French Zone), Central America (Salvador and British Honduras), Yugoslavia, Persia [Iran], and French Colonies (Oceania).